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Using a 41-test battery of cognitive-perceptual-motor tests supplemented by standardized tests of intelligence, visual perception, eye hand coordination, linguistics, and non-verbal integration, a group of 200 maladjusted school age children from grades 1, 2, 3, and 5 was compared with a group of problem-free children similar in size, sex distribution, and other relevant characteristics. The findings supported the hypothesis that a significant percentage of maladjusted school children have serious immaturities in cognitive-perceptual-motor functioning which are associated with their behavior maladjustment and learning disorder. Two clearly distinguishable groups were found within each maladjusted grade group: a low dysfunction group of 60% who functioned well and similar to the problem-free children on cognitive motor tasks; and a high dysfunction group of 40% who were extremely low in their performance. This high dysfunction group was considered highly vulnerable to problem behavior and learning disorder, needing maximum attention at school. A major product of the research, a complete test procedure, which was refined for economical use as a screening instrument in schools, clinics, and day care centers, and which provides information useful in remedial and retraining programs, is included. The final report is also in the ERIC system. (Author)

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Part I - Testing for Cognitive-Perceptual-Motor Dysfunction

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June 1968

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Summary

On the basis of previous research with maladjusted children in public schools, clinical observations of emotionally disturbed children in a hospital setting, and the research literature on learning disabilities, it was apparent that many children who are called emotionally disturbed display evidence of some developmental disorder that interferes with their adaptation to their early environment, complicates their interactions with parents and peers and contributes to their experiencing school learning as stressful. This study aims to contribute to our general understanding of maladjusted children and specifically to examine the hypothesis that a significant percentage of maladjusted school children have serious immaturities in cognitive, perceptual or motor functions which contribute to behavior maladjustment and learning disorder.

Recognizing the limitations that standardized tests have in measuring all aspects of cognitive, perceptual and motor functioning, a 41-test battery was devised as part of this project based in part on existing achievement, reading readiness, diagnostic reading, motor coordination, and perceptual discrimination tests. This battery, supplemented by standardized tests of intelligence, visual perception, eye-hand coordination, linguistics, and non-verbal integration, was administered to two groups of public school subjects, of both sexes, from grades 1, 2, 3 and 5: 200 experimental subjects, who demonstrated moderate to severe maladjustment in the classroom and 200 control subjects, who were problem-free as determined by the schools.

The findings from this comparison indicated a significant difference in performance on cognitive-motor tests by the experimental and control groups. The problem-free group functioned rather uniformly on these tests,

demonstrating little dysfunction on tests of cognitive-motor functioning. Sixty percent of the maladjusted subjects performed very similar to the control group. However, approximately 40% of the maladjusted subjects from each grade demonstrated severe cognitive-motor dysfunction, confirming the initial hypothesis.

These results contribute substantial evidence to the theory of secondary emotional disturbance for many children with behavioral maladjustment and provide a method for their identification. A major product of this research is the test battery, subsequently reduced in size by statistical methodology, useful and economical to employ in schools and clinics. Finally, the test battery supplements intelligence and achievement testing by providing a profile description of individual strengths and weaknesses related to school learning, useful in planning remediation and prevention programs.

Chapter I

Introduction

This manual represents the culmination of several years of conceptualizing, theorizing, devising and researching--to say nothing of the preceding years of clinical observation. What follows is an approach to the examination of children who show many of the symptoms of "emotional disturbance" and who most frequently come to the attention of psychologists or psychiatrists because of learning and/or behavior difficulties. It seems important to the authors to introduce this work with a strong declaration of what it is not: that is, there is no intention in this manual to present this approach as the answer to the diagnosis of all children with adjustment problems. The children who prove to be better understood because of the use of the method described here represent one subgroup among the global population called "emotionally disturbed," a sizeable subgroup, it is true, but how large a proportion of that population it is that may be seen by any single practitioner depends principally upon the sources of his referrals, whether school, parents, pediatrician or social agency.

The discovery that many children with learning problems are lacking in basic skills (those we call cognitive-motor skills) is not a new one. Such studies as those by Braun (1963), Kirk and Bateman (1962), and Frostig (1961), show a relationship between deficits in concept formation, linguistics and visual perception and failure to learn to read. It appears that a comparison of a group of disabled readers with a group of normal achievers will demonstrate that the poor readers are more deficient on any variable studied than are the normal readers. The unique contribution of the present battery of tests is that it offers the opportunity to measure a large number of these skills in a given child and suggests that deficits in any of these skills may reflect such unevenness in functioning that disability in learning or in behavior has a high likelihood of appearance.

Additionally, the approach of the present authors differs from preceding work in that it is based on the assumption that a large number of children who show such familiar maladaptive behaviors as overaggressiveness, hyperactivity, low tolerance for frustration, hypoactivity, withdrawal or asociality may have developed this type of personality picture because their inability to cope with the demands of their environment has made them especially vulnerable to stress. Such a child has consequently developed what we call a secondary emotional disturbance because it is a function not of rejection or mishandling by parents of a potentially normal child but of interaction between a child who is developing unevenly and his perhaps unaware environment. (Rubin, 1964.)

Important in understanding this type of child is the recognition that, because of his deficits, his vulnerability to stress is greater than that of the intact child. The world is less well organized and less clearly structured for him. He is ordinarily much more dependent upon adults to help him find his way in the world than is the normal child and, when the mother meets his needs by offering this support and structure, his observable immaturity leads people to assume that the mother is interfering with his growth by "coddling" him. Their special vulnerability to stress also makes many of these children more susceptible than their siblings to the effects of any pathology in their parents. This, we feel, has led many practitioners into attributing the difficulties that the child exhibits to the problems that the parents show without giving sufficient weight to the probable interaction variables. Such a tendency to over weight home factors gives insufficient attention to the extent to which maladaptive behavior in a child may be a function of immediate stress factors, e.g. rigidity in school expectations, as well as a curriculum structure which makes no place for the atypical child, and anxious, dissatisfied, critical or punitive attitudes by the parents toward a child's lack of school achievement or a level of achievement that is below the parents' aspirations for their child.

Recognition of the role of stress in maladaptive behavior and the manner in which retarded development in some areas leads a child to find stressful, experiences which may be exhilarating to the intact child has important implications for school people, parents and mental health practitioners. Such recognition inevitably requires (1) that a comprehensive evaluation be made of the current functioning of the child; (2) that the sources of maladjustment be identified; (3) that remedial approaches be developed to improve functioning and (4) that guidelines be provided for parents and teachers to reduce immediate stress around the child. The presence of deficits not only leads to misinterpretations on the part of others in the environment but it has a major impact on the direction of the child's personality development. At every stage in development, this child sees himself as unable to cope with simple tasks; his need to depend upon his parents and other adults prevents him from achieving the kind of mastery that contributes to positive personality growth. It is a psychological truism that each success in meeting a challenge adds to the individual's confidence that he can conquer the next challenge that arises. The recognition by the environment that the child's failure to perform in the classroom or to adjust to life situations may be a function of factors other than motivation or dynamics serves a therapeutic purpose, especially if it leads the school and home to provide the kind of challenges that are within the success level of the child.

Major purpose of present approach

The principal purpose of the present approach is to describe recognizably the kind of child that is seen especially in the school situation and to provide a method for preferably early identification of "high risk" or vulnerable children in order to do meaningful planning, by either prevention or remedial programs. The child with cognitive-motor deficits is frequently found to be poorly oriented in time and space: he is frequently unable to learn to tell time, he does not know his birthday and he cannot find his way from his classroom to the playground without help. His attention span is usually described as short, he often has not established a definite hand preference and he seems to forget instructions quickly. His written productions tend to be markedly inadequate--messy, poorly organized, sometimes constricted, and qualitatively below the level of most of his peers.

It is not possible to give a single picture of the unevenly developing child that will apply to all such children. As mentioned, such a child may be overactive, but he may also be a daydreamer. He may be the class clown or he may never make himself known to others. He usually has more than one skill deficit and these may be in auditory as well as in visual perception, in integration and conceptual skills, in fine motor control or gross motor abilities. He is usually within at least the "average" range of intelligence and this leads to expectations on the part of the school for achievement that he cannot accomplish. In the experience of the authors, it has not been unusual to see such children with very superior I.Q.'s, ranging as high as 139 on the Wechsler Intelligence Scale for Children, and in such cases the bewilderment of the school is understandable. J. C. Reed says (1957, p. 13), "There is general agreement among reading specialists that a positive relationship exists between intellectual ability and reading; however, the magnitude of the relationship has not been clearly demonstrated." He reports that investigators have found correlations between reading and intelligence ranging from .20 to .80. Occasionally, also, these children exhibit extremely high achievement in one area, such as reading, but cannot control their behavior appropriately and cannot begin to perform the simplest arithmetic operations. Again the apparent contradictions make the child a puzzle to the school and parent observers.

It is because of the multiplicity of possible symptoms and the infinite possible skill combinations that a major thesis of this book is that all children should receive a thorough assessment in the areas that appear related both to academic achievement and to successful coping with the environment. Other workers, such as Maslow (1967), deHirsch (1966), and Silver, Hagin and Hersch (1965), whose primary aim has been the development of remediation methods, have also moved in the direction of a comprehensive assessment rather than a single-test approach. This is particularly important because the authors have observed that uneven development in children appears to create more problems than does a generally flat, but perhaps middle average, level of abilities. Hence, the child with an I.Q. of 130 whose fine motor control is only slightly below average for his age will exhibit more anomalies of adjustment than will the child with an I.Q. of 100 whose fine motor control is age appropriate.*

In nearly all cases of children who come to the attention of the special services in school, the clinic or the private practitioner, there is an early history of problems. A kindergarten teacher has observed "immaturity," and other teachers have reported inappropriate or puzzling behavior in the early grades. By the time the child is seen in the upper elementary years--by the time, that is, that someone has decided to stop waiting for him to outgrow whatever ails him--there has been a serious negative effect upon his personality development. He has a poor self image, much shame and guilt, and a strong conviction that he can never succeed at anything. Overcoming his pattern of avoidance and denial is a major task for the teacher entrusted with planning a remedial program for such a child and there is no way of making up completely for the several years that he has failed to acquire and practice skills that his peers have been developing in that time. For that reason, we urge that, wherever possible, a program of cognitive-motor skill assessment be developed for use with kindergarten and first-grade children, although this approach need not be considered without usefulness even with upper elementary and older school children.

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* Some examples of the types of children who fall into the category we are discussing will be found in Chapter III below.

Chapter II

Validating the Approach in a Public School Setting

In the research design we tested the proposition that a significant percentage of school maladjusted children would demonstrate dysfunction in cognitive, perceptual or motor areas. A comprehensive assessment battery of both standardized and unstandardized tests was administered to a sample of 200 maladjusted and 200 problem-free children drawn from the public schools of Roseville, Michigan. These two samples were compared on cognitive-motor functioning and found to be significantly different on a wide range of scores representative of the nine areas of cognitive-motor functioning. The predictive tests discriminating between maladjusted and problem-free children were identified and a cognitive-motor dysfunction score was determined for each child, an aggregate score consisting of the number of tests on which the individual scored below a selected criterion.

Sample

Subjects consisted of boys and girls drawn from the total public school population of grades one, two, three and five of the Roseville, Michigan public schools. The community is a relatively homogeneous lower middle class population. A description of the parents' educational backgrounds appears in Table 1. Most of the parents had completed high school with only a very small percentage stopping school before the tenth grade or going on for college work. Only five percent completed college. This is a community where most families own single homes.

The maladjusted subjects were selected on the basis of high scores on the Behavior Checklist* (see Appendix A), a teacher identification instrument

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* The Behavior Checklist was developed for a previous study (Rubin, Simson, and Betwee, 1966) and validated against clinical judgment.

Table 1

Educational Background of Parents

	Highest Grade Achieved			
	Mother		Father	
Grade	Mean	S.D.	Mean	S.D.
1	11.2	1.7	11.8	2.0
2	11.2	1.5	11.4	2.0
3	11.2	1.6	11.0	2.5
5	10.8	1.8	10.5	2.4

consisting of 39 different descriptions of maladjusted behavior reflecting disoriented, anti-social, unassertive, or immature behavior. The subjects chosen for this study and designated the experimental group were those who represented on the average the lowest 4.4% of the population. This sample is represented in the last column of Table 2 which represents a full description of the Behavior Checklist ratings for the total population of 4500 subjects tested. (Rubin and Braun, 1968.) Two hundred problem-free subjects were drawn from the same population consisting of those receiving zero scores on the Behavior Checklist. In addition none of the subjects in this control group had either repeated a grade in school or had been referred to an agency in the school or in the community for behavior disorder. For both groups subjects scoring with a Full Scale I.Q. of 81 or below were eliminated. The distribution of subjects by sex, age, I.Q. and grade are shown in Table 3. The groups were balanced for sex distribution and on the average were equivalent in age.

Method

The tests were administered over a period of a school year under the supervision of the authors. Test examiners without prior training or experience in test administration were given an intensive four-week workshop in the administration of tests, applications with children and clinical experience with the test battery itself prior to the testing of the project subjects.

The Tests

A basic battery of standardized tests was administered as follows: The Wechsler Intelligence Scale for Children (Wechsler, 1949), the Bender Visual Motor Gestalt Test (Bender, 1938), the Raven Progressive Matrices Test (Raven, 1960), the Frostig Test of Developmental Perception (Frostig, et al,

Table 2

A description of Behavior Checklist ratings on the total population from Grades 1, 2, 3 and 5

GRADE	TOTAL SAMPLE		NO. OF SUBJECTS 1 or MORE SYMPTOMS		PROBLEM GROUP 8 or MORE SYMPTOMS			FINAL STUDY SAMPLE *		
					NO.		% OF TOTAL NO.	NO.	% OF PROBLEM GRP.	% OF TOTAL NO.
1st	M 659		468		82		12.4	30	6.4	4.6
	F 591		346		38		6.4	20	5.8	3.4
	T	1250		814		120				
2nd	M 562		369		82		14.6	30	8.1	5.3
	F 538		275		35		6.5	20	7.3	3.7
	T	1100		644		117				
3rd	M 545		358		56		10.3	30	8.4	5.5
	F 556		263		17		3.1	20	7.6	3.6
	T	1101		621		73				
5th	M 527		322		49		9.3	30	9.3	5.7
	F 520		235		14		2.7	20	8.5	3.8
	T	1047		557		63				
TOTALS		4498		2636		373	8.3	200	7.6	4.4

* Grade 1, 2 males	-	8 or more items, 4 or more items checked 3 times
" 3 "	-	8 or more items, 3 or more items checked 3 times
" 5 "	-	8 or more items, 4 or more items checked 2 times
Grade 1, 2 females	-	8 or more items, 3 or more items checked 2 times
" 3, 5 "	-	6 or more items, 3 or more items checked 2 times

Table 3

Distribution of Sex, Age, I.Q. and Achievement for All Grades

	Mean Scores for Grades and Groups							
	Grade 1		Grade 2		Grade 3		Grade 5	
	Exp.	Cont.	Exp.	Cont.	Exp.	Cont.	Exp.	Cont.
Males	30	30	30	30	29	30	30	30
Females	20	20	19	20	20	20	20	20
Total No.	50	50	49	50	49	50	50	50
Age (mos.)	80.7	82.3	96.5	94.6	107.3	105.5	129.8	126.5**
WISC IQ								
Verbal	96.1	106.9**	97.3	107.3**	98.6	104.2*	101.2	112.0 **
Perform.	103.2	113.3**	99.8	113.0**	99.3	110.1*	102.9	112.9**
Full scale	99.4	110.8**	98.3	111.0**	98.8	107.6**	102.3	113.5**
Met. Achiev.								
Av. Gr. Ach.[1]	-.22	+.31**	-.26	+.59**	+.04	.92**	-.63	.55**

* .05

** .01

[1] This score was derived from the Average Grade Achievement score of the Metropolitan Achievement Test and represents the discrepancy between test grade achievement and chronological age grade placement.

1961), and three tests (Visual Decoding, Motor Encoding and Vocal Encoding) from the Illinois Test of Psycholinguistic Abilities (McCarthy and Kirk, 1961). All of these tests were administered individually except the Frostig which was given in small groups of four to six subjects. Two examiners were used when the maladjusted subjects were tested in a group.

The Lafayette Clinic Cognitive-Motor Battery consisted of 41 tests resulting in 59 scores, reflecting performance in nine areas of cognitive, perceptual and motor functioning*(see Table 4).

1. Tests of Visual Perception:

There are five tests that measure varying aspects of visual perception. The emphasis is on perceptual discrimination and orientation in space. Two of the tests (I-E, I-F) are more complex, involving tachistoscopic presentation. The tests were derived from the Lee Clark Reading Readiness Test (Lee and Clark, 1960), Monroe Reading Aptitude Test (Monroe, 1935) and the Durrell Analysis of Reading Difficulty (Durrell, 1955). The tests from the battery are supplemented by Tests 2, 3, 4 and 5 of the Frostig Developmental Test of Visual Perception.

2. Tests of Auditory Perception:

Two tests are used to measure auditory discrimination. Both were presented in this study using prerecorded tapes to eliminate visual cues and examiner differences. The discrimination test was devised by Irwin and Jensen (1963) for use with cerebral palsied children. The auditory constancy task was developed for this project.

3. Tests of Memory Function:

The five memory tasks involve visual and auditory modes; non-verbal and verbal material with both immediate and delayed recall. The tests were

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* A complete description of the tests, their administration and scoring, is presented in Chapter IV. The test booklet, which is also available separately, is contained in Appendix B.

Table 4

Cognitive-Perceptual-Motor Functions

Function	Definition
1. Visual perception	Central response to visual stimulus, inferred from verbal or motor response
a. Fine discrimination	Recognition of similarities and differences when the stimuli--presented visually--are increasingly similar, checked along various dimensions including form, size and space
b. Constancy	Holding of a symbolic representation of a form, in both simple and complex stimulus situations
2. Auditory perception	Central response to auditory stimulus inferred from verbal or motor response
a. Fine discrimination	Recognition of similarities and differences between auditorily presented stimuli; not musical sounds, but, rather, language symbols
b. Constancy	Holding of an auditory stimulus and recognition of it among competing stimuli
3. Memory	Recall of visual and auditory stimuli
a. Immediate rote	Recall of digits or unrelated series of items, immediately following presentation
b. Immediate meaningful	Recall of rote details, content and meaning, immediately after presentation
c. Delayed	Recall of rote details, after time lapse
4. Orientation	Awareness of relationships between oneself and events and objects in the environment, along the dimensions of time, space and size
5. Integration	
a. Non-verbal	Ability to combine discrete tangible stimuli into meaningful whole
b. Symbolic	Ability to abstract qualities or meanings from stimuli and to form constructs transferable from situation to situation, using materials that are tangible, abstract or numerical
c. Inferential reasoning	Abstraction of meaning from written or oral material that is suggested by the content but not explicitly stated
6. Linguistics	
a. Input	Ability to understand what is said and to demonstrate formation of habits of language in keeping with construction of English
b. Output	Communication and expression of ideas either through gestures or words
7. Fine motor control	Control of fine movements in simple and complex situations
8. Gross motor coordination	Coordination of large muscles in purposeful manner, including eye-hand coordination, extremities and proprioception
a. Eye-hand	Use of large muscles to perform coordinated tasks
b. Extremities	Smooth functioning of arms & legs
9. Tactile-kinesthetic proprioceptive perception	Central response to stimuli presented only to tactual senses--inferred from motor and verbal responses
	Utilization of information from large muscles for central balance

derived from Monroe Reading Aptitude Test, Durrell Analysis of Reading Difficulty, and the Detroit Reading Readiness Test (1962).

4. Tests of Orientation:

The orientation tests covering time, space, and size involve measurement of both concept and information. The time and size orientation tests were adapted from a questionnaire by Pollack and Goldfarb (1957b); other size and space tests were derived from the New York Test of Arithmetical Meanings (Wrightstone, et al, 1956) and the Lee Clark Reading Readiness Test. The test for midline orientation, ability to cross over the midline of the body, was taken from Ayres (1966).

5. Tests of Integration:

In this section both verbal symbolic and non-verbal conceptualization was measured. Simple jigsaw puzzles were used for non-verbal integration, supplemented by the Raven Progressive Matrices Test (Raven, 1960). The tests of verbal integration included subtests from the California Test of Mental Maturity (Sullivan, et al, 1957), Monroe Reading Aptitude Tests, Gates Reading Test (Gates, 1958b); Gates Reading Survey (Gates, 1942), and California Achievement Test (Tiegs and Clark, 1957). The last two were supplemented by original items to extend the range of difficulty.

6. Tests of Fine Motor Control:

The tests used here involve perceptual-motor behavior but the scoring emphasis was on motor control. Two fine motor control tests were devised for this study and have been previously reported (Llorens and Rubin, 1967). Test 1 from the Frostig supplements those tests in this area. In addition, the Bender Visual Motor Gestalt Test, administered and scored according to Koppitz (1963), was used.

7. Tests of Gross Motor Coordination:

Several tests from the Kephart Perceptual Survey (Kephart, 1962) were used, including the walking board, jumping, identification of body parts, imitation of movements and obstacle course.

8. Linguistics Tests:

Items from the Gates Basic Reading Test (Gates, 1958a), were adopted for this section of the battery. This is a test of auditory decoding and was supplemented by three tests from the Illinois Test of Psycholinguistic Abilities: visual decoding, motor encoding and vocal encoding.

9. Tests of Tactile and Kinesthetic Perception:

For tactile discrimination, five tests were adopted for this battery. In all tests, visual cues were eliminated as the subject was asked to locate a single stimulus or two simultaneous stimuli on the hand, recognize a simple form drawn on the hand or recognize simple geometric forms by touch. The Face-Hand Test reported by Pollack and Goldfarb (1957a) was also used. The motor memory test from the Ayres 40-Test Battery (1966) and the Seguin Form Board, administered with vision occluded were the items used for measures of kinesthetic perception.

Achievement Tests:

Achievement test scores were obtained on all subjects. For the children in grades two, three and five, Metropolitan Achievement Test scores routinely obtained by the schools were used. First graders, who do not normally receive Achievement Tests in the schools were given the Metropolitan Achievement Test Primary Battery by project examiners. The scores utilized from this testing included Word Knowledge, Word Discrimination, Reading, Arithmetic and Average Grade Achievement. For statistical comparisons a discrepancy score was derived from the difference between test grade achievement and chronological age grade placement.

Results

The performance on the various tests by the maladjusted (experimental) and problem-free (control) samples was compared by analysis of variance to determine which tests reliably discriminated between the two groups. A comparison of the means and standard deviations for both groups on all scores from standardized and cognitive-motor tests are presented in Tables 17, 18, 19 and 20 for each grade in Appendix C. Of the 59 scores derived from the cognitive-motor battery (eliminating the standardized tests) 24 or 41% discriminated at the .05 or .01 levels for the first grade; 23 or 39% at the second grade; 19 or 32% at the third grade; and, 14 or 24% at the fifth grade (see Table 5). There were seven tests that discriminated at all grade levels; nine that discriminated for grades one, two and three.

The standardized tests discriminated between maladjusted and problem-free groups to a high degree. Table 5 presents this data. All of the nine tests showed differences significant at the .05 or .01 level; five at the first grade; eight at the second grade; six at the third grade and five at the fifth grade.

Cognitive-Motor Dysfunction Score

A composite score was determined for each subject, based on the number of discriminating tests on which his score was below an established criterion. This criterion was a cutting score at least one standard deviation below the mean for the total grade sample for each test. If none of an individual's scores fell below the cutting score his cognitive-motor dysfunction score would be zero. The maximum score for a first grade subject, for example, would be 24. The distributions of cognitive-motor dysfunction scores for each grade sample are provided in Table 6. In actuality, the

Table 5

Tests that Discriminate between Maladjusted and Problem-Free Groups

Test # or Name	Function	Grade			
		1	2	3	5
Frostig I	Fine motor control - simple		.01	.01	.05
Frostig II	Visual perc. - form discrimination		.01		
Frostig III	Visual perc. - constancy	.01	.01	.05	.01
Frostig IV	Visual perc. - orientation in space		.01	.05	.01
Frostig V	Visual perc. - orientation in space	.01	.05	.01	
Bender-Gestalt	Fine motor control - complex	.01	.01	.01	.01
Raven Matrices	Symbolic integ.-with concrete materials	.01	.01	.05	.05
ITPA-Vis.Decod.	Symbolic integration - nonverbal	.05			
ITPA-Mot.Encod.	Linguistic input		.01		
I-A	Visual perception - form	.01	.05		
I-B	Visual perception - form, simple		.01	.01	
I-D	Visual perception - form, complex	.05	.05		
I-E	Visual perception - constancy	.01	.01	.01	.01
I-F	Visual perception - constancy		.01	.01	.01
II-A	Aud.perc.-discrim. of similarities & diffs.	.05	.05	.05	.05
II-B	Auditory perception - constancy	.01	.01	.01	.01
III-A	Visual memory - form		.01		
III-B	Memory - immediate meaningful		.05		.01
III-C	Memory - immediate meaningful	.05			
III-E	Memory - delayed meaningful		.01		
IV-A	Orientation - time	.01	.01	.01	.01
IV-B	Orientation - size	.01	.01	.01	
IV-C	Orientation - midline		.01		
IV-D	Orientation - space	.01	.01		.01
IV-F	Orientation - space	.05			
V-A	Integration - nonverbal	.01		.01	
V-B	Symbolic integration		.01	.05	
V-C	Symbolic integration - abstract	.01	.01		
V-D	Symbolic integration - abstract	.01	.01	.01	.01
V-E	Symbolic integration - numerical	.01	.01	.01	
VI-A	Fine motor control	.01	.01	.01	.01
VI-B	Eye-hand coordination	.01	.01	.01	.05
VII	Gross motor coordination - jumping	.01	.05		.05
VII	Identification - gross motor coord.	.01		.01	
VIII-A	Linguistic input - total score	.01		.01	
IX-D	Tactile kinesthetic - face-hand			.05	
IX-E	Tactile kinesthetic - moving stimulus	.01		.01	.01
IX-F	Tactile kinesthetic - motor memory (left)	.05	.05		
IX-F	Tactile kinesthetic - motor memory (right)	.01			
IX-F	Tactile kinesthetic - motor memory (total)	.01			

Table 6

Distributions of Cognitive-Motor Dysfunction Scores for All Grades

Cog.-Motor Dysf. Score	Grade 1							Grade 2							Grade 3							Grade 5						
	Exp.			Cont.				Exp.			Cont.				Exp.			Cont.				Exp.			Cont.			
	M	F	Σ	M	F	Σ	Σ	M	F	Σ	M	F	Σ	Σ	M	F	Σ	M	F	Σ	Σ	M	F	Σ	M	F	Σ	Σ
19								1	0	1				1														
18										0				0														
17										0				0														
16	2		2				2			0				0														
15	0		0				0			0				0														
14	0		0				0		1	1				1														
13	0		0				0			0				0														
12	0	1	1				1	2	0	2				2	1	0	1				1							
11	1	0	1				1	0	1	1				1	2	0	2				2	1	1	2				2
10	3	0	3				3	1	0	1				1	2	0	2				2	2	1	3				3
9	1	0	1				1	4	1	5				5	2	1	3				3	0	2	2				2
8	2	1	3				3	6	1	7				7	0	3	3				3	1	0	1				1
7	4	2	6				6	1	2	3		1	1	4	4	0	4	1	0	1	5	3	0	3				3
6	3	0	3				3	2	1	3		1	1	4	3	2	5	0	0	0	5	2	0	2				2
5	3	2	5	1		1	6	3	1	4	1	1	2	6	3	2	5	0	2	2	7	5	3	8				8
4	3	2	5	2		2	7	1	3	4	4	1	5	9	3	1	4	1	1	2	6	4	3	7	0	3	3	10
3	3	3	6	1	2	3	9	3	2	5	0	1	1	6	2	2	4	4	0	4	8	3	1	4	2	1	3	7
2	4	5	9	6	3	9	18	3	4	7	9	5	14	21	1	0	1	5	2	7	8	5	5	10	10	0	10	20
1	0	2	2	10	4	14	16	2	1	3	10	4	14	17	4	7	11	11	5	16	27	1	4	5	10	10	20	25
0	1	2	3	10	11	21	24	1	1	2	6	6	12	14	2	2	4	8	10	18	22	3	0	3	8	6	14	17
TOTALS	30	20	50	30	20	50	100	30	19	49	30	20	50	99	29	20	49	30	20	50	99	30	20	50	30	20	50	100

cognitive-motor dysfunction scores range from zero to 19 for all subjects. The distributions of these scores are graphically presented in Figure 1. The problem-free subjects in all of the grades performed essentially the same on these tests, obtaining scores of zero, one, two or three for the most part, with only three of these subjects obtaining a score of six. None of the problem-free children obtained a dysfunction score of more than seven. On the other hand, 40% of the maladjusted subjects in grade one, 49% in grade two, 41% in grade three obtained a score of six or more, and 42% in grade five obtained scores of five or more. Within the maladjusted group some subjects (approximately 60%) performed similarly to the problem-free children, showing very few dysfunction scores (see Table 7).

On the basis of cognitive-motor dysfunction score, the maladjusted groups can be divided into two major types, one with low dysfunction (score of five or less) and one with high dysfunction (score of six or more). This finding is consistent for the different grades. The emphasis here, like that in some similar research, is on selecting from a sample of maladjusted subjects those individuals who show high cognitive-motor dysfunction. Mora, et al (1967, reported that 40% of emotionally disturbed children at a residential treatment center demonstrated signs of organic dysfunction. The method that they called a pediatric neurological examination was comprised of tests of cognitive, perceptual and motor functioning. The subjects from that study who did poorly on their tests were those who made the least improvement in their academic program. Pollack, and coworkers (1968), also report that on the basis of a three-year follow-up, poor outcome in adolescents and young adults was associated with judgments of minimal brain dysfunction based on an earlier history of cognitive-motor dysfunction. In the present study, the additional identification of deficit scores with particular

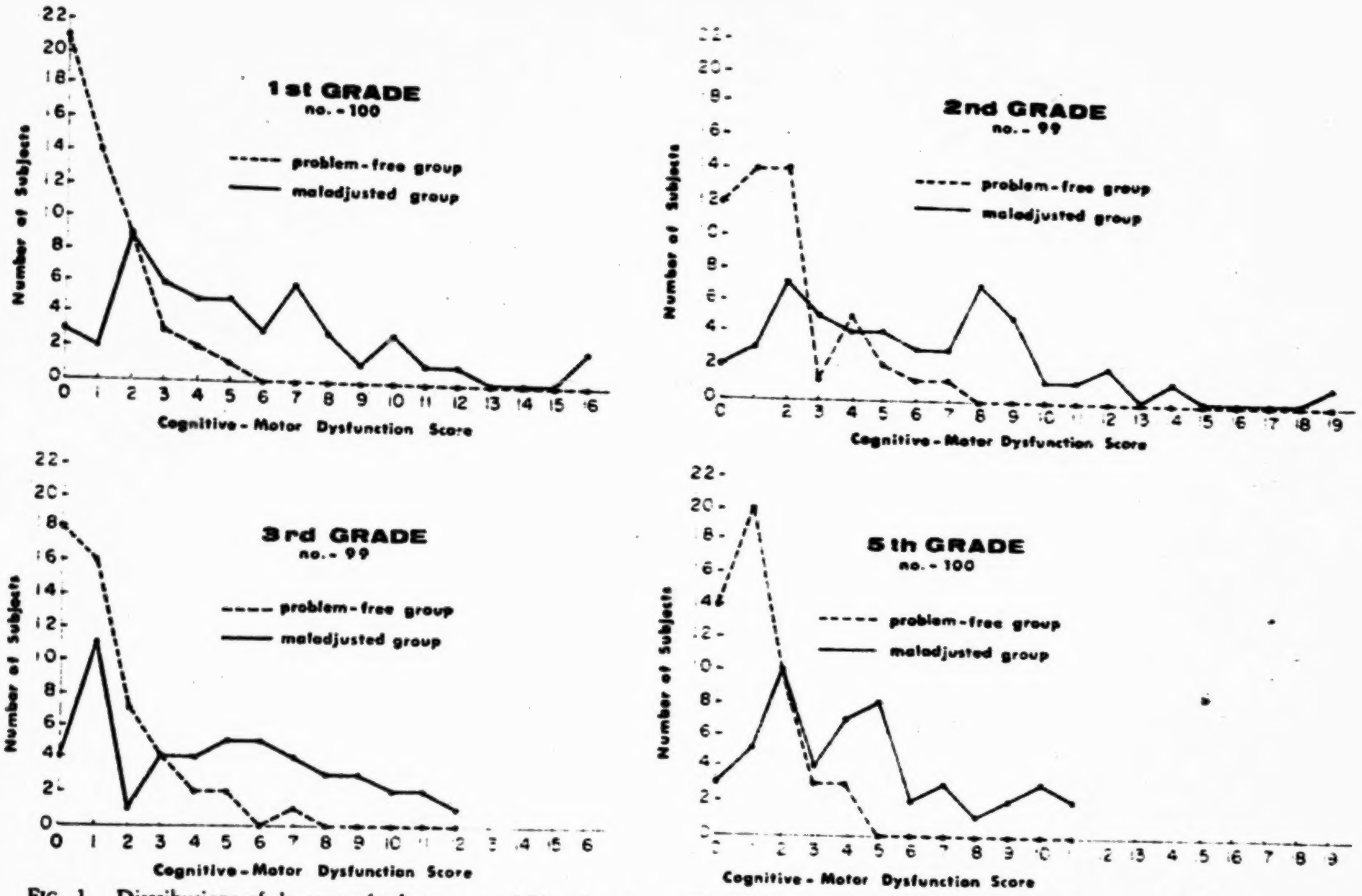


FIG. 1. Distributions of the sum of subtest scores falling 1 or more *SDs* below mean for each grade (cognitive-motor dysfunction score)

Table 7

Comparison of Maladjusted and Problem-Free Groups on Number of Error Scores Above and Below Criterion

	Number of Subjects			
	Maladjusted		Problem-Free	
Grade	≤ 6	≥ 6	≤ 6	≥ 6
1	30	20	50	0
2	25	24	48	2
3	29	20	49	1
Grade	≤ 5	≥ 5	≤ 5	≥ 5
5	29	21	50	0

cognitive-motor functions leads to a profile description of weaknesses from which programs of training can be planned.

Cognitive-Motor Dysfunction and Secondary Emotional Disorder

In our background discussion we theorized that the adjustment problem for many children was related to some developmental immaturity in cognitive, perceptual or motor functioning, creating a special problem for adaptation to life's tasks, including, or especially, those at school. Our findings indicate that a significant percentage of children with adjustment problems have cognitive-motor dysfunction, verifying this point of view. Using this method it is possible to locate those maladjusted children with high cognitive-motor dysfunction and to consider new directions for the treatment of this subgroup of so-called disturbed children: methods that will improve their skills and enhance their capacity to cope successfully with school and environmental demands. This testing program can delineate the specific areas of dysfunction for each child and can lead to remediation that will be specific to each child's difficulties. Such a program, supplemented by curriculum adaptations, teacher consultation and parent counseling, especially if introduced early in the child's school experience, can serve as a significant program of prevention of chronically disordered adjustment. An evaluation of parts of this program, specifically the training method, was the subject of the second phase of this research and is described in full in Volume II.

Cognitive-Motor Dysfunction and Learning Problems

Although the subjects for this study were originally identified on the basis of behavioral maladjustment, achievement testing revealed a significant percentage of subjects with academic learning problems. The maladjusted subjects showed a much higher percentage of academically retarded subjects than the control group. This was anticipated from the manner of selection of subjects. In grades one, two, three and five, 70, 76, 65 and 80 percent were below grade expectancy. In the control groups, 14 to 28 percent were below grade (see Table 8). However, the majority of those maladjusted subjects with below grade functioning were those with high cognitive-motor dysfunction (see Table 9). For grades one, two, three and five, 100, 83, 85 and 86 percent, respectively, of the high dysfunction subjects were functioning below grade expectancy. Of the low dysfunction subjects, 47, 48, 55 and 69 percent from grades one, two, three and five, respectively, were below grade.

There is a strong association of academic retardation with behavior maladjustment, the percentage for the maladjusted being three or four times that of the problem-free. Almost twice as many high dysfunction subjects are academically retarded as compared to the low dysfunction subjects. All of the first grade subjects with high dysfunction were academically retarded. For all grades, the high and low dysfunction subjects are significantly different on average total achievement (see Table 10).

These findings further emphasize the utility of identifying high dysfunction subjects for remedial intervention (Rubin, 1969). These subjects are more consistently the ones with academic difficulties as well as behavior problems and the evidence suggests that the immediate causative factors lie with cognitive-motor dysfunction.

Sex Differences

Sex differences played a role even in the selection of subjects. The criteria on Behavior Checklist scores for selection of female subjects had to be lower for there were not as many girls rated with high scores on the Behavior Checklist (see Table 2). In order to keep the degree of disturbance relatively comparable, a smaller number of girls were selected.

Table 8

Number and Percent of Male and Female Subjects Below Grade Expectancy on Average Grade Achievement [1]

	Experimental				Control			
	Total N	Cases Below Grade			Total N	Cases Below Grade		
Grade		Male	Female	Total		Male	Female	Total
1	50	26 (87)	9 (45)	35 (70)	50	5 (17)	6 (30)	11 (22)
2	49	24 (80)	13 (65)	37 (76)	50	10 (33)	4 (20)	14 (28)
3	49	19 (63)	13 (65)	32 (65)	50	7 (23)	0 (0)	7 (14)
5	50	24 (80)	16 (80)	40 (80)	50	7 (23)	3 (33)	10 (20)

[1] Discrepancy score

Table 9

Number and Percent of Male and Female High and Low Dysfunction Experimental Subjects Below Grade Expectancy on Average Grade Achievement[1]

	Number and Percent of Subjects											
	HIGH DYSFUNCTION						LOW DYSFUNCTION					
	Number			Cases Below Grade			Number			Cases Below Grade		
Grade	M	F	Σ	M	F	Σ	M	F	Σ	M	F	Σ
1	16	4	20	16 (100)	4 (100)	20 (100)	14	16	30	9 (64)	5 (31)	14 (47)
2	17	7	24	15 (88)	5 (71)	20 (83)	13	12	25	5 (38)	7 (58)	12 (48)
3	14	6	20	11 (55)	6 (30)	17 (85)	15	14	29	9 (60)	7 (50)	16 (55)
5[2]	14	7	21	13 (93)	5 (71)	18 (86)	16	13	29	10 (63)	10 (77)	20 (69)

[1] Discrepancy score

[2] High dysfunction = $\overline{>}$ 5

Table 10

Comparison of High and Low Dysfunction Groups on Metropolitan Achievement Test Scores

Grade	Mean Average Grade Achievement[1]		
	High Dysf.	Low Dysf.	p
1	-.38	-.12	$< .05$
2	-.53	.01	$< .01$
3	-.44	.38	$< .05$
5	-.95	-.40	$< .05$

---

[1] This score is the difference between chronological age grade placement and grade achievement on the total Metropolitan Achievement Test

On the basis of dysfunction, the boys outnumbered the girls at each grade level. Fifty-three percent of the boys and 20% of the girls at the first grade demonstrated high dysfunction; the same figures for the other grades are: second grade - 57% boys, 35% girls; third grade - 43% boys, 30% girls; fifth grade - 47% boys and 35% girls (see Table 6).

The differences in performance by males and females were not found to the same extent when either maladjusted and problem-free groups or high and low dysfunction groups were compared (see Tables 8 and 9) on academic achievement. Males outnumbered females in the maladjusted group in grades one and two; were approximately equal in grades three and five. In the problem-free group, girls outnumbered boys in grades one and five; the reverse for grades two and three. This lack of consistency is seen again in the low dysfunction maladjusted group. It is only in the high dysfunction maladjusted group that boys outnumber girls consistently with respect to academic retardation.

These findings are consistent with other findings pertaining to the sex differences on such things as reading disability, juvenile delinquency, and emotional disturbance (Bentzen, 1963). The current findings demonstrate the higher incidence of cognitive-motor dysfunction in pre-adolescent boys. The findings further suggest that the higher incidence of boys in samples of behavior problem or reading disability cases may be due to the higher incidence of males with cognitive-motor dysfunction.

Cognitive-Motor Dysfunction and I.Q. Scores

When the high and low dysfunction first grade experimental subjects are compared on WISC I.Q., no significant differences were found. However, in the upper grades, the differences in I.Q. scores demonstrated significance (see Table 11). One possible meaning of this finding is that cognitive-motor

Table 11

Comparison of High and Low Dysfunction Groups on WISC I.Q.'s

	Mean WISC I.Q.'s					
	Dysfunction		Dysfunction		Dysfunction	
Grade	High	Low	High	Low	High	Low
	Verbal		Performance		Full Scale	
1	94.4	97.3	99.5	105.7	96.6	101.3
2	96.0	98.5	95.7	103.7**	95.5	101.0*
3	90.0	104.6**	95.6	101.9*	91.8	103.7**
5	94.9	105.7**	96.5	107.5**	95.3	107.3**

* Significant at .05 level

** Significant at .01 level

functioning is a part of intelligence test measurement but that differentiated functioning in special skills is not reflected at the younger ages in I.Q. scores. As individuals grow older, the WISC I.Q. items reflect the special skills, such as verbal conceptualization, non-verbal integration, perceptual-motor speed, which make up intellectual performance. If, then, there is a relative deficit in one or more of these differentiated skills, the I.Q. is more likely to be lowered.

In all instances, the high dysfunction groups scored lower on the intelligence test scores. Although there is a moderately high correlation between dysfunction and I.Q., not all of the variance in dysfunction is accounted for in the I.Q. measure (see Table 12). Thus we can expect that more subjects with low I.Q.'s than with high I.Q.'s will have high dysfunction. Using a method of pairs matched for sex and I.Q., we established that in each of three I.Q. groups (80-99; 100-109; and 110 or >), there were some cognitive-motor dysfunction scores above and below the criterion for dysfunction (a score of six for grades one-three; five for grade five) at all grades (see Table 13) and the maladjusted group was still differentiated into high and low groups, as before. Thus, cognitive-motor dysfunction is not simply a matter of high or low I.Q. The mean cognitive-motor dysfunction scores for the three I.Q. groups are noticeably different for maladjusted and problem-free groups at all four grade levels, with I.Q. held constant (see Table 14).

Although these findings indicate a relationship between I.Q. measures, maladjustment and cognitive-motor dysfunction, they suggest that although cognitive-motor functioning is being measured to some extent by the WISC, the I.Q. does not differentiate adequately between high and low dysfunction in maladjusted groups.

Table 12

Correlations of Dysfunction Score with WISC Full Scale I.Q.

Grade	Product-Moment Correlation WISC Full Scale I.Q.
1	-.425
2	-.435
3	-.622
5	-.588

All significant

Table 13

Comparisons of Number of Subjects Above and Below Dysfunction Criterion for I.Q. Categories - All Grades

		Number of Subjects					
		I. Q. Groups					
		80-89		100-109		110 or >	
Grade		Exp	Cont	Exp	Cont	Exp	Cont
1	6 or >	3	0	5	0	1	0
	< 6	5	8	7	12	6	7
2	6 or >	2	1	5	0	2	0
	< 6	2	3	9	14	5	7
3	6 or >	4	0	2	0	1	0
	< 6	5	9	10	12	5	6
5	5 or >	1	0	0	0	1	0
	< 5	5	6	5	5	8	9
TOTALS	> Criterion	10	1	12	0	5	0
	< Criterion	17	26	31	43	24	30

Table 14

Comparison of Mean Dysfunction Scores for I.Q. Categories - All Grades

	Mean and Range of Dysfunction Scores							
	1st Grade		2nd Grade		3rd Grade		5th Grade	
I.Q. Groups	Exp	Cont	Exp	Cont	Exp	Cont	Exp	Cont
80- 99	6.4 (2-16)	2.4 (0-5)	5.8 (2-11)	4.0 (2-6)	5.8 (1-10)	1.7 (0-5)	4.3 (1-10)	1.8 (0-4)
100-109	4.8 (2-8)	1.2 (0-4)	4.4 (0-9)	2.4 (0-5)	2.7 (0-9)	1.6 (0-3)	3.2 (2-5)	2.4 (1-4)
110 >	2.7 (0-8)	.3 (0-1)	3.0 (0-8)	1.0 (0-2)	2.8 (0-6)	.8 (0-3)	1.9 (0-7)	1.1 (0-2)

Cognitive-Motor Dysfunction and Behavior Maladjustment

The finding of behavior maladjustment is not always correlated with high cognitive-motor dysfunction. Table 15 presents a comparison of high and low dysfunction groups for each grade on the total Behavior Checklist score. In grades one and three, the two dysfunction groups differ; in grades two and five, they do not. For the first three grades, the high dysfunction group shows on the average more symptoms than the low; this relationship does not hold for the fifth grade. These findings suggest that behavior maladjustment cannot be equated with cognitive-motor dysfunction. The finding of a high degree of behavior maladjustment does make it imperative to do cognitive-perceptual-motor testing to determine if the child does demonstrate evidences of high cognitive-motor dysfunction.

Summary

The findings of this research study provide methods to identify and assess those children who require a combined educational and psychological approach. It is with these children that the schools can use their special service resources such as special education teachers, school psychologists and school social workers most effectively. Programs of prevention and remediation can be instituted.

The psycho-educational screening provided here can aid mental health clinics to identify among their patients those who represent problems of emotional disturbance secondary to cognitive-motor dysfunction. In this way the children who need a therapeutic approach that combines educational and psychological methods can be more adequately served. The clinical application of these findings offers many opportunities for new programming.

Table 15

Comparison of High and Low Dysfunction Groups on Behavior Symptoms

Grade	Mean Total Score Behavior Checklist High Dysfunction	Mean Total Score Behavior Checklist Low Dysfunction	p
1	16.8	10.8	$< .05$
2	32.8	30.7	n.s.
3	30.1	19.7	$< .01$
5	19.8	20.4	n.s.

CHAPTER III

FROM APPROACH TO PRACTICE

The clear-cut findings of the above research have immediate implications for the clinician, whether in a school or in a clinic. In the effort to determine the sources of a child's symptomatic behavior, it is important to include an assessment of the cognitive-motor abilities he has developed, especially if the major area of difficulty is in school.

It is not intended that the cognitive-motor battery be a substitute for other psychological measures. This assessment is most meaningful in the context of a total psychological evaluation which includes a full-scale evaluation of intellectual and personality factors, including projective materials, such as the Rorschach, the Thematic Apperception Test, Incomplete Sentences and Draw a Family or Draw a Person. Even in instances where it is clear that the principal problem is uneven development--with specific cognitive-motor limitations--the projective materials help to delineate the degree to which the difficulties in coping have distorted personality development. At times, they indicate that some emotional problems are present which have developed independently of the other difficulties and, at other times, they reveal that the stress on the child has resulted in massive ego disruption, to the point of psychosis. Obviously, planning of a therapeutic or remedial program for any child must be influenced by the findings of these projective materials.

Because of the limitations of the intelligence test in prediction of school success, there is some tendency among educators and psychologists to want to ignore these measures completely. However, in making maximum use of the cognitive-motor battery and planning remedial techniques, the intelligence test is a valuable tool. The obtained IQ is one important way of gauging the degree to which developmental unevenness and cognitive-motor deficits have interfered with the total intellectual development, or, to put it another way, the degree to which the child has been able to make use of areas of strength in achieving a given intellectual level. Additionally, it appears on the basis of present experience that the obtained IQ is helpful in determining the ceiling which may be reached by an individual child with the benefit of remedial intervention. A child of above average IQ will, it appears, make greater eventual gains as a result of intervention than will a child with the same level of cognitive-motor functioning but with a dull-normal or borderline IQ.

It is because of the necessity for interrelating the findings of many aspects of the evaluation that we recommend that the battery be employed usually by a psychologist--either a clinical psychologist or an educational psychologist who has had experience with projective techniques. Administration of the cognitive-motor battery may be done by non-professional people, if they have been carefully trained, but the interpretation of the results is the responsibility of a professional person experienced in the use of intelligence tests and projective materials.

Use of Abbreviated Scales

The size of the cognitive-motor battery frequently brings protests from school personnel that they do not have time to give such a complete assessment to every child who is referred to them.

Following the lead of this study, a composite battery can provide a clear differentiation between high and low dysfunction subjects among children already identified as maladjusted. By providing a shorter version that has a similar capacity, screening can be accomplished effectively and economically. It is even possible to use a few of the tests as a preliminary screening instrument to select those subjects who would receive the entire battery. These three approaches are provided by a refined statistical analysis of the initial battery of cognitive-motor and standardized tests.

The original battery containing 41 tests, along with several standardized tests, was used to compare maladjusted and problem-free children on nine areas of cognitive, perceptual and motor functioning. The 29 cognitive-motor and four standardized tests (see Table 5, page 19) that significantly differentiated between groups at any of the four grade levels were retained as the most complete assessment of cognitive-motor skill functioning in elementary school age children. Subsequently, this number of tests was reduced to 20, retaining from each functional area the ones that demonstrated the highest correlations with the total dysfunction score originally derived from the entire battery. These tests are underlined in Table 21, Appendix C.

Finally, using a multiple regression technique, the most discriminating measures were identified and are listed in Table 16. This table gives the combination of measures that at each grade contributes maximally to the identification of the child with cognitive-motor deficits. Thus, the clinician or school psychologist may use a briefer battery or even selected items, together with the Wechsler Intelligence Scale for Children to gain clues as to the appropriate subjects to receive the more complete battery.

Although it is possible, on the basis of rather few measures, to select the child with symptomatic problems secondary to cognitive-motor

Table 16

Refined Test Battery and Simplified Battery for Each Grade

TEST NAME	GRADE 1 and 2[1]	 3[2]	 5[3]
Frostig III	A[4]		A
Frostig IV	C	K	
I-B	I	E	
I-E		J	C
I-F		H	
II-A	J	G	
II-B	G	C	F
III-A			I
III-E	E		
IV-A			E
IV-B			
V-D		B	
V-E	B		
VI-A	H		
VI-B		F	G
VII	F		D
VIII-A		I	
IX-E			H
Raven		A	J
Bender	D	D	B

1) R = .797 2) R = .972 3) R = .916

4) At each grade level, the tests are ordered by letter symbol according to the amount contributed to the total [illegible] The simplified battery, then, consists of all lettered tests.

limitations, planning for an individual child requires a more complete assessment. It might be possible to recognize that a child fits into the high cognitive-motor dysfunction group on the basis of his Bender Gestalt productions and a very few more measures, for example. However, that will not tell the remedial teacher whether he also has visual and auditory perception difficulties, as well. The more complete battery, then, may be used, from which a profile can be drawn which can provide a meaningful basis for remedial intervention.

Interpreting the Profile

Comprehensive assessment of a wide variety of cognitive, perceptual and motor skills provides the schools with information that is useful for understanding the child's symptoms and for planning programs. It supplements the standard I.Q. and achievement tests with an assessment of strengths and weaknesses related to learning demands. It provides information from which it is possible to determine whether the child's symptoms are secondary to stress resulting from the interaction of cognitive-motor dysfunction and school expectations. It can give school social workers some directions to explore in their search for the role of the home in the total problem.

A wide variety of cognitive-motor skills are sampled by this procedure. Using the model of the child as an information processing system the tests measure input through perceptual processes, central integrative functions including reasoning and memory, and output, including fine and gross motor coordination. For each child the current functioning levels are measured and compared with the performances of others of like age and grade. By using the normative tables, provided for six-month age levels from age six years two months to nine years seven months, it is possible to determine if the subject's score is at the mean or significantly below (see Appendix D). As an alternative method, a score may be compared to the grade norms presented in Appendix D.

The tests may be grouped according to specific skill areas and judgments may be made regarding each child's functioning in three major areas: perceptual, integrative and motor, and again in 19 sub-areas within these major categories. The tests may be grouped for analysis and profiles may be drawn according to the following breakdown.

Perceptual:

Tactile discrimination: Tests IX-D and IX-E

Kinesthetic discrimination: Test IX-F

Visual form discrimination: Tests I-A and I-B

Visual spatial orientation: Frostig IV and Test I-D

Visual form constancy: Frostig III, Tests I-E and I-F

Auditory discrimination: Test II-A

Auditory constancy: Test II-B

Language input: Test VIII-A

Integrative Functions:

Verbal symbolic reasoning: Tests V-B, V-C and V-E

Inferential reasoning: Test V-D

Time orientation: Test IV-A

Space orientation: Tests IV-C, IV-D and IV-F

Integrative functions: (continued)

Size orientation: Test IV-B

Auditory memory:

Immediate recall: Tests III-B and III-C

Visual memory:

Immediate recall: Test III-A

Auditory memory:

Delayed recall: Test III-E

Non-verbal integration: Test V-A and the Raven Progressive Matrices Percentile Score

Motor Output:

Fine motor control: Tests VI-A and VI-B and Bender-Gestalt Koppitz Score

Gross motor coordination: Kephart Tests - Jumping and Identification

These profiles (see Figures 2 and 4) may be used for each individual, to assess his skills and determine to what degree cognitive-motor dysfunction is a significant problem. The tests may be used at the early or later elementary level to screen groups of maladjusted children to identify those with high dysfunction for whom remedial programs may be planned. (See Volume II.) The cognitive-motor battery may be used as a screening instrument at the kindergarten level to identify high-risk children for whom altered kindergarten and primary curricula may be introduced as part of a prevention program (Rubin, 1969).

In the preparation of the profiles for the clinical examples to follow, the grade norms were used. When a score fell within plus or minus one standard deviation for the total grade it was judged to be average; a score at plus one standard deviation or above was judged above average; a score at minus one standard deviation was judged below average; and, any score below minus two standard deviations was called very poor. Only the scores from the refined battery were utilized: those tests which discriminated significantly between experimental and control groups at any grade level.

Clinical Examples:

Barry was nine years and five months old when he was identified by the third grade teacher as maladjusted. On the basis of high scores on the Behavior Checklist he was included in our experimental sample. Those items which were checked three times, indicating that these were shown very frequently, are as follows:

6. Aggressive in underhanded ways
7. Seeks attention excessively
8. Very short attention span
10. Shows signs of nervousness (nailbiting, crying, tics, rocking)
17. Lacks responsibility for self, always has excuse for shortcomings
18. Resists limits or rules in group games
26. Makes odd noises
29. Is disoriented in space, is confused as to directions given
31. Tendencies toward primitive hostilities, temper tantrums, wild destruction
33. Anti-social tendencies (steals, lies, destroys property, bullies, defies, resents discipline)

In the second grade Barry was about a half year retarded in reading and arithmetic but by the time he was in the fourth grade he was about two and a half years retarded in these subjects.

On the standard test of intelligence, the Wechsler Intelligence Scale for Children, he was found to be functioning within the average range with a verbal I.Q. of 96, a performance I.Q. of 107 and a full scale I.Q. of 101. There was considerable variation on the verbal scale with scores ranging from six (digit span) to 11 (similarities). Scores on the non-verbal scale were more uniform with only the block design subtest below 10. He obtained a scale score of 14 on object assembly and picture completion. The Frostig tests revealed below-age functioning on four of the five subtests with scores as low as five (Test III, form constancy) and six (Test I, eye-motor coordination). The Raven Progressive Matrices Percentile Score was 18, within the range of average functioning for our group of third graders.

His performance on the Lafayette Clinic Cognitive-Motor Battery shows marked intra-individual variation with many scores at a level of minus one standard deviation and some below minus two standard deviations, when compared to grade norms (see Figure 2). The pattern of these scores, shown in Figure 3 , provides a graphic demonstration of areas of strengths and weaknesses. The profile of scores indicates special weakness in the integrative functions including abstract reasoning, spatial concepts and memory functioning involving both visual and auditory modalities. In addition to these areas of dysfunction he shows weakness in fine and gross motor coordination. The overall dysfunction score was 10, well within the range of the maladjusted sample.

This information, derived from the cognitive-motor battery, indicates high intra-individual variable functioning of this child only hinted at by the verbal-performance I.Q. discrepancy and the variability noted within the WISC verbal scale. Based on our clinical research we expect such a

LAFAYETTE CLINIC
C-P-M BATTERY
SUMMARY SCORE SHEET

NAME BARRY GRADE 3 AGE 9 yrs 5 mos

SERIES I: VISUAL PERCEPTION

A 13
B 22
D 8
E 13
F 51.5

SERIES II: AUDITORY PERCEPTION

A 21
B 19

SERIES III: MEMORY

A 13.5
B 6
C 19
E 6

SERIES IV: ORIENTATION

A 22
B 16
C 0
D 12
F 5

SERIES V: INTEGRATION

A 401 sec.
B 12
C 29
D 12
E 11

SERIES VI: FINE MOTOR CONTROL

Total A 7
Total B 2

SERIES VII: GROSS MOTOR COORDINATION

4 Jumping 5
5 Ident. 8

SERIES VIII: LINGUISTICS - INPUT

A 14

SERIES IX: TACTILE AND KINESTHETIC

D 10
E 4
F - Left 20.5
F - Right 17.0
F - Total 37.5

BENDER KOPPITZ SCORE: 6

RAVEN PERCENTILE: 18%

FROSTIG

1 6
2 10
3 5
4 7
5 7

Figure 2. Summary of Test Scores - BARRY

Name BARRY

INDIVIDUAL PROFILE

Age 9 yrs 5 mos

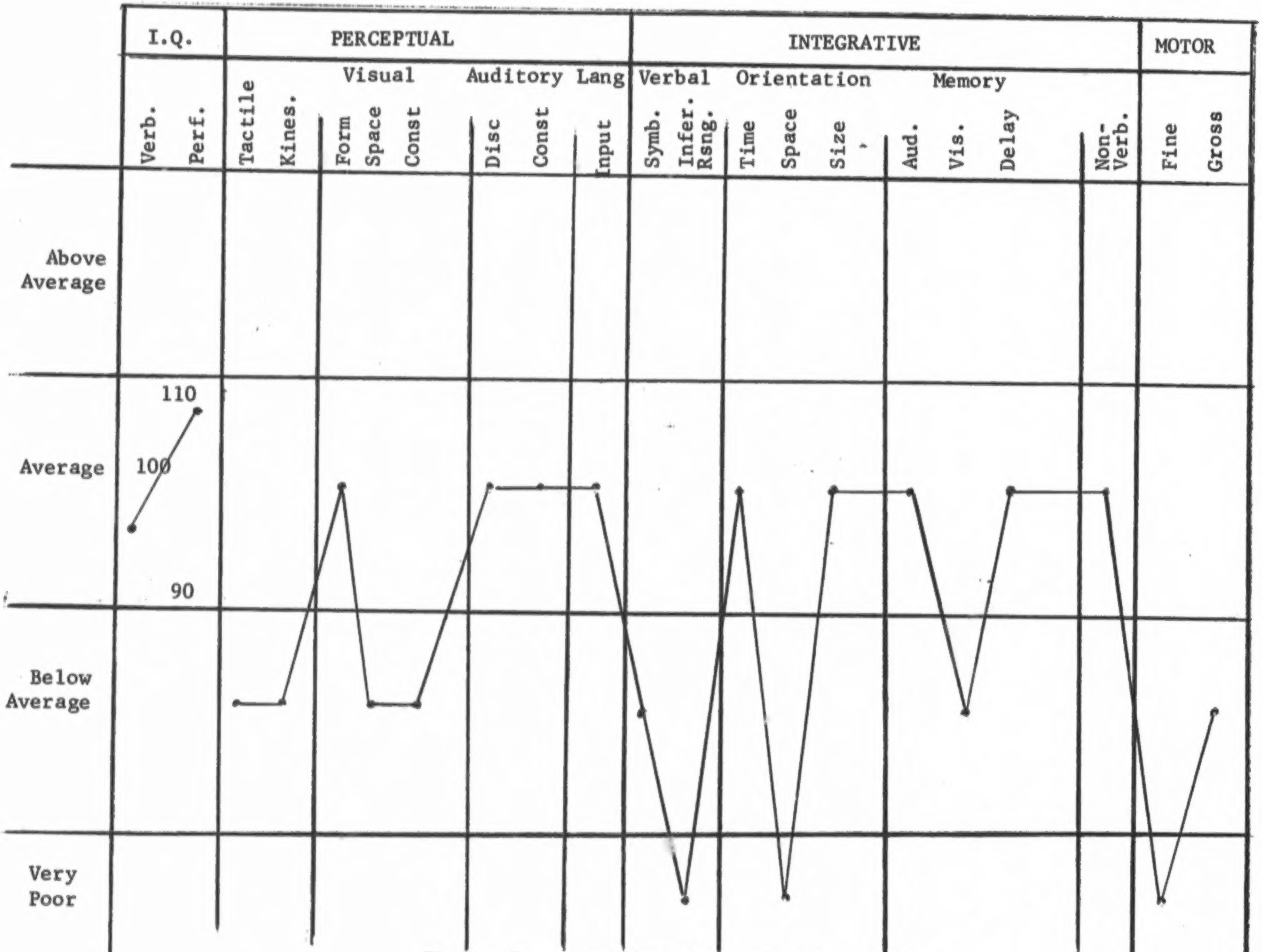


Figure 3. Cognitive-Motor Profile - BARRY

youngster to approach the learning tasks with significant limitations affecting progress in learning. With some limitation in visual perception, coupled with memory and fine motor control dysfunction, learning to read and the carry-over of learning in the early grades would be especially difficult. With evidence pointing to dysfunction in abstract reasoning one would anticipate further problems in the fourth grade and beyond where there is more reliance on comprehension skills. His most recent achievement test scores showing two and a half years' retardation in the middle of the fourth grade confirmed this prediction. The report from the principal at the end of the year indicated that he would be failed.

Barry experiences considerable stress in school and probably has from the very beginning. His poor coordination, both fine and gross, has probably also contributed to feelings of inadequacy in his attempts to compete with the other boys. His reaction, according to the symptoms displayed in school, appears to be an aggressive, hostile one. By the third grade the symptoms of disorientation are less noticeable to the teacher as compared to the hostile behavior. We would hypothesize that much of his behavior maladjustment is secondary to the stress and anxiety he experiences in attempting to compete with others in play and at school.

Barry was included in our special skill training program (see Volume II). An individualized program of skill training was determined for Barry from his test scores emphasizing first the perceptual and motor areas and then the verbal abstract functions.

CASE EXAMPLE NO. 2:

The maladjusted behavior displayed by Danny when he was identified by his second grade teacher was somewhat different than the first case. According to his initial Behavior Checklist form the items checked three times were as follows:

8. Very short attention span

9. Can't work independently

27. Makes irrelevant or inappropriate remarks

28. Misinterprets simple statements

In addition, the following items were checked two times:

12. Daydreams

15. Poor coordination (trouble with buttoning, tying shoes, getting shoes on correct feet)

29. Is disoriented in space, is confused as to directions given

This complex of symptoms suggests a somewhat immature youngster, inattentive and aloof with definite evidences of disorientation to his environment. He was included in our experimental sample of maladjusted children and received the complete testing. In addition, he was the subject for a sub-study in which he received a neurological examination, EEG, psychiatric examination and full developmental and social history data was obtained from the mother. At the time of testing, Danny was approximately six months retarded in reading, three months advanced in arithmetic, and about six months retarded on the overall Metropolitan Achievement Test.

On the Wechsler Intelligence Scale for Children Danny received an overall full scale I.Q. of 100, showing more capabilities on the verbal scale (verbal I.Q. 108) than on the performance test (performance I.Q. 92).

The range of functioning on the verbal scale was from a scale score of nine on vocabulary to a scale score of 17 on similarities. Conceptual thinking seemed quite advanced. On the non-verbal scale, two of the tests were definitely below average. On picture arrangement and object assembly he obtained scale scores of seven and his highest score was on picture completion, a score of 11. All of his test scores on the Frostig Test were age appropriate, his Koppitz Bender Score was three, well below the average for our second grade sample, and his Raven Percentile Score of 85 indicated well above average functioning in the non-verbal integration area.

On the cognitive-motor battery, Danny showed a total dysfunction score of six which is the lowest limit for the high dysfunction group. All of his scores from the refined battery are presented in Figure 4, from which the profile shown in Figure 5 was drawn.

Although Danny's profile does not show dips into the very poor category it is apparent that there is marked intra-individual variability among the various cognitive, perceptual and motor skills. Verbal symbolic functions, visual and auditory discrimination functions appear to be adequate but memory functioning is certainly disturbed, whether visual or auditory modalities are utilized. Fine and gross motor coordination are definitely below average along with kinesthetic perception. Orientation for time and size are also low in this profile. Even though there is a noticeable discrepancy between verbal and performance I.Q.s, both are within the average range and do not indicate as does the Cognitive-Motor Battery the degree of variability to this boy's functioning. In contrast to the previous example, one would anticipate that Danny's problems would be most apparent in the primary grades where skills involving fine motor

LAFAYETTE CLINIC
C-P-M BATTERY
SUMMARY SCORE SHEET

NAME DANNY GRADE 2 AGE 8 yrs 3 mos

SERIES I: VISUAL PERCEPTION

A 20
B 18
D 8
E 7
F 34.5

SERIES II: AUDITORY PERCEPTION

A 22
B 16

SERIES III: MEMORY

A 14.0
B 13
C 25
E 7

SERIES IV: ORIENTATION

A 15
B 15
C 6
D 15
F 8

SERIES V: INTEGRATION

A 300 sec.
B 10
C 21
D 16
E 11

SERIES VI: FINE MOTOR CONTROL

Total A 7
Total B 2

SERIES VII: GROSS MOTOR COORDINATION

4 Jumping 6
5 Ident. 5

SERIES VIII: LINGUISTICS - INPUT

A 14

SERIES IX: TACTILE AND KINESTHETIC

D 10
E 7
F - Left 32.5
F - Right 24.0
F - Total 56.5

BENDER KOPPITZ SCORE: 3

RAVEN PERCENTILE: 85%

FROSTIG

1 10
2 8
3 9
4 10
5 10

Figure 4. Summary of Test Scores - DANNY

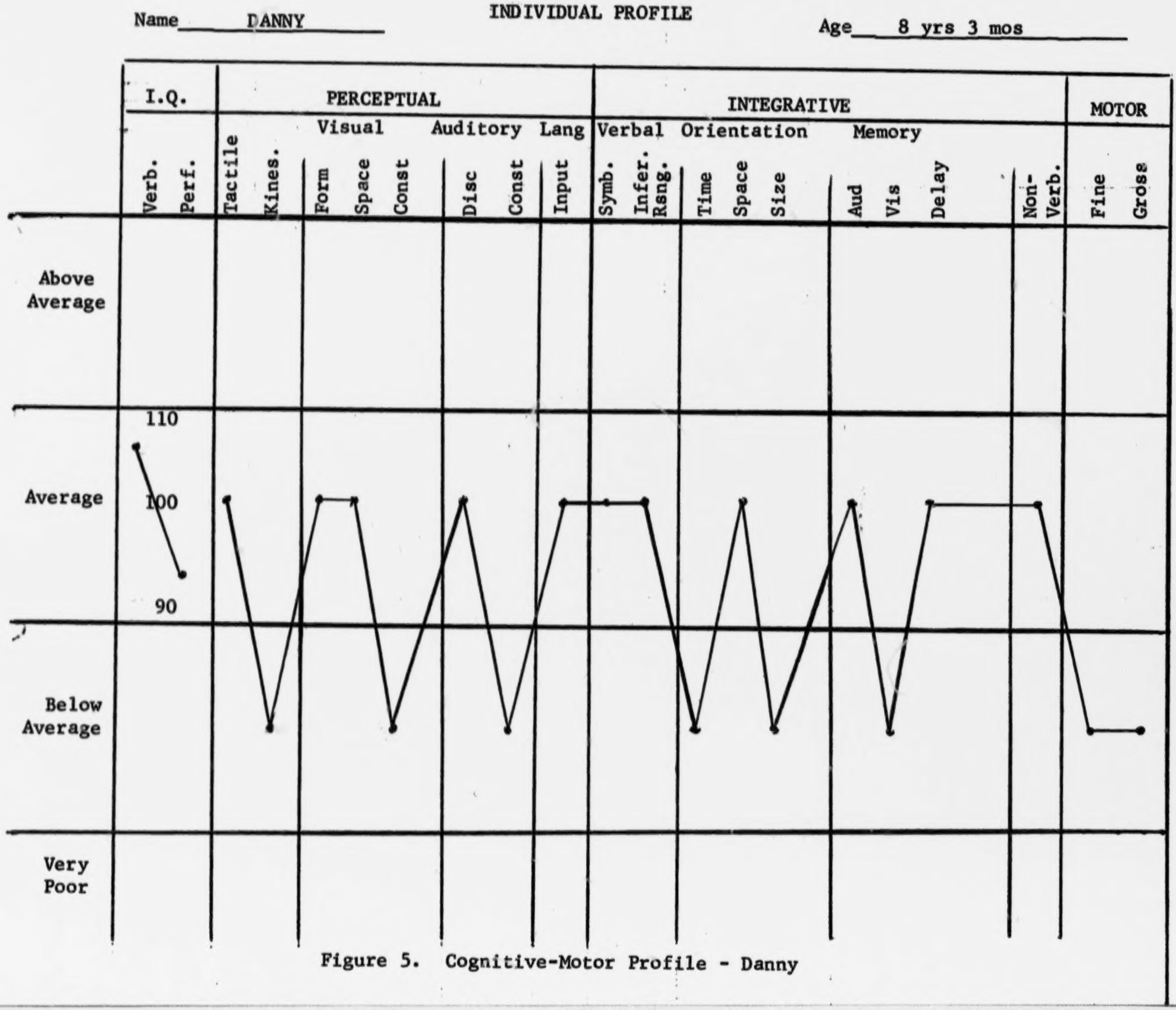


Figure 5. Cognitive-Motor Profile - Danny

control and memory, especially visual memory functioning, are relied upon heavily. His good verbal skills should allow for continued progress in learning, although the presence of such marked variability would indicate continued difficulty in adjustment. When Danny was retested in the third grade for achievement he was slightly over one year retarded in both reading and arithmetic. When he was entered into the special class for skill training, an individual program was prepared emphasizing primarily the perceptual-motor areas.

The additional clinical diagnostic information available on Danny is typical of the youngsters described by us as having high cognitive-motor dysfunction or by others as showing learning disability. There were positive findings only on the psychiatric interview, where he was described as a restless, jerky, somewhat immature youngster who is impulsive, distractible, and quick to give up in the face of frustration. He did not appear to be overly anxious according to the psychiatrist nor did he demonstrate unusual fears, hostility, nor untoward perceptions of friends or parents or teachers. On both the neurological examination and the EEG the findings were within normal limits. Facts from the social history indicated a youngster, first in the family, born at term, weighing between five and six pounds, following essentially an uneventful pregnancy on the part of the mother. He accomplished the milestones of development at the expected times and with the exception of some difficulties in toilet training was described as a responsive youngster, neither overly active nor quiet. There are certain factors, however, that are worthy of note. Mother is reported to have had a fall during the last trimester of her pregnancy with Danny and at the time of the delivery the child was held back. He was described as well and healthy at birth. When he began talking in sentences at 19 to 24 months his speech was initially unclear but improved subsequently. He was described as having adequate motor coordination as a preschooler and enjoyed both indoor and outdoor play. It is of some significance that the father was described as having major problems similar to those of Danny. Father did not go beyond the eighth grade and was described as having a history of problems similar to that of Danny, including both academic and behavior difficulties. In addition, there is a history on the father's side of behavior problems as well as a history of epilepsy in father's sister.

In general, these findings do not contribute to any definite neurological diagnosis to help explain Danny's poor adjustment in learning and behavior but do contribute mildly to the hypothesis that his development was in some way atypical, possibly related to genetic factors.

Use of the Profile in the School

The special education teacher or remedial specialist is probably best equipped to utilize the cognitive-motor profile for individualized programming. By knowing the extent of the weaknesses and in what skills, along with information from achievement tests, the specialist teacher can decide whether the child needs complete skill training in a specialized program, or whether there are some areas that can be trained by the itinerant specialist, while the child continues in his regular grade. Information from the profile can be helpful to regular class teachers as well. Knowing that a child has special weaknesses in fine motor control and eye-hand coordination, for example, in the presence of other average or above average skills, may help her to be more understanding of the child's special difficulties with written work. These may be manifested as poor achievement, slow or delayed productions or by behavior difficulties, including lowered motivation. The school psychologist or teacher specialist can use this approach meaningfully to supply the classroom teacher with a better appreciation of individual differences.

Use of the Profile with Parents

Performance at school is so often interpreted to parents as dependent in either I.Q. or emotional factors. Using the approach suggested by this study it is possible to demonstrate how limitations in skill affect the child's achievement at different grades and with different subject materials. This interaction effect may be a crucial factor in understanding the child's motivational pattern. Administrators and school social workers can utilize the profile when appropriate to indicate the child's variable capacities and point out his areas of vulnerability. By this method it is often possible to generalize these findings to the home situation. In this manner, the parents can be helped to examine the child's behavior difficulties at home, recognizing what situations may put the child under stress in that setting. Continued counseling, either individually or with groups of parents may contribute to a relief of stress for the child at home.

Use of the Profile at the Mental Health Clinic

Understanding of emotional disturbance is not complete without an assessment of stress factors operating at home and at school. In many instances, the stress these settings may impose is not apparent without an adequate appreciation of the child's vulnerabilities. The cognitive-motor profile can provide the information necessary to assess the child's capacities for adaptation to learning environments. From this it follows that recommended treatment programs may include cognitive-motor training alone or in combination with remediation education as necessary supplements to individual psychotherapy. The results of this study already indicate that for a significant number of children such a combined treatment program is essential for a successful outcome.

References

Ayres, A. J. Southern California Kinesthesia and Tactile Perception Tests. 1966. Western Psychological Services, Los Angeles, California.

Bender, L. A Visual Motor Gestalt Test and Its Clinical Use. 1938. The American Orthopsychiatric Assoc., New York, N. Y.

Bentzen, F. "Sex Ratios in Learning and Behavior Disorders." 1963. American Journal of Orthopsychiatry, 33, No. 1, 92-98.

Braun, J. S. "Relation between concept formation ability and reading achievement at three developmental levels." 1963. Child Development, 34: 675-682.

deHirsch, K., J. Jansky and W. S. Langford. Predicting Reading Failure. 1966. Harper & Row, New York, N. Y.

Detroit Reading Readiness Test. Department of Instructional Research, Detroit Board of Education. Revised edition - copyright, 1962.

Durrell, D. D. Durrell Analysis of Reading Difficulty. 1955. Harcourt, Brace & World, Inc., New York, N. Y.

Frostig, M., D. LeFever and J. Whittlesey. "A Developmental Test of Visual Perception for Evaluating Normal and Neurologically-Handicapped Children." 1961. Perceptual and Motor Skills, 12: 383.

Frostig, M. "Perceptual ability and school adjustment in kindergarten and primary grades." Paper presented at the December 1961 meeting of the California State Psychological Association.

Gates, A. I. Gates Reading Survey for Grades 3 (2nd Half) to 10. 1942. Bureau of Publications, Teachers College, Columbia University, New York, N. Y.

Gates, A. I. Gates Basic Reading Test. 1958. Bureau of Publications, Teachers College, Columbia University, New York, N. Y. (a)

Gates A. I. Gates Primary Reading Test for Grade 1 and Grade 2 (first half). 1958. Bureau of Publications, Teachers College, Columbia University, New York, N. Y. (b)

Irwin, O. C. and P. J. Jensen. "A Test of Sound Discrimination for Use with Cerebral Palsy Children." 1963. Cerebral Palsy Review, 24, 5-11.

Kephart, N. C. The Slow Learner in the Classroom. November, 1962. Charles E. Merrill Books, Inc., Columbus, Ohio.

Kirk, S. and B. Bateman. "Diagnosis and remediation of learning disabilities." 1962. Exceptional Children, 29: 73-78.

Koppitz, E. Bender Gestalt for Young Children. 1963. Grune & Stratton, New York, N. Y.

Lee, J. M. and W. W. Clark. Lee-Clark Reading Readiness Test. 1960. California Test Bureau, McGraw-Hill Book Co., Monterey, California.

Llorens, L. A. and E. Z. Rubin. Developing Ego Functions in Disturbed Children: Occupational Therapy in Milieu. 1967. Wayne State University Press, Detroit, Michigan.

Maslow, P. "Development, assessment and remediation of perceptual functions." Paper presented at 1965 Annual Meeting, American Psychological Association, Washington, D.C.

McCarthy, J. J. and S. A. Kirk. Illinois Test of Psycholinguistic Abilities. 1961. Urbana, Illinois.

Monroe, M. Reading Aptitude Tests. 1935. Houghton Mifflin Co., New York, N. Y.

Mora, G., M. Talmadge, F. Bryant, E. Amanat, E. M. Brown, and D. Schiff. "Psychiatric syndromes and neurological findings as related to academic underachievement-implications for education and treatment." Paper presented at 1967 annual meeting, American Orthopsychiatric Association, Washington, D.C.

Pollack, M. and W. Goldfarb. "The Face-Hand Test in Schizophrenic Children." 1957. A.M.A. Archives of Neurology and Psychiatry, 77, 635-642. (a)

Pollack, M. and W. Goldfarb. "Patterns of Orientation in Children in Residential Treatment for Severe Behavior Disorders." 1957. American Journal of Orthopsychiatry, 27, No. 3. (b)

Pollack, M., S. Levenstein, and D. F. Klein. "A three-year post hospital follow-up of adolescent and adult schizophrenics." 1968. American Journal of Orthopsychiatry, 38, 94-109.

Raven, J. C. Guide to the Standard Progressive Matrices Sets A, B, C, D and E. 1960. H. K. Lewis & Co., Ltd., London, England.

Reed, J. C. "The relationship between the primary mental abilities and reading achievement at given developmental levels." 1957. Unpublished doctoral dissertation, University of Chicago, Chicago, Illinois.

Rubin, E. Z. "Secondary emotional disorders in children with perceptual-motor dysfunction." 1964. Unpublished paper presented at Annual Meeting, American Orthopsychiatric Association, Chicago, Illinois.

Rubin, E. Z. "A Psycho-Educational Model for School Mental Health Planning." Accepted for publication, Community Mental Health Journal, October or December, 1969.

Rubin, E. Z., C. Simson and M. Betwee. Emotionally handicapped children and the elementary school. 1966. Wayne State University Press, Detroit, Michigan.

Rubin, E. Z. and J. Braun. "Behavioral and learning disabilities associated with cognitive-motor dysfunction." 1968. Perceptual and Motor Skills, 26, 171-180.

Silver, A. A., R. A. Hagin and M. Hersch. "Specific reading disability: teaching through stimulation of deficit perceptual areas." 1965. American Journal of Orthopsychiatry, 37, 744-752.

Sullivan, E. T., W. W. Clark and E. W. Tiegs. California Test of Mental Maturity. 1957. California Test Bureau, McGraw-Hill Book Co., Monterey, California.

Tiegs, E. W. and W. W. Clark. California Achievement Tests. 1957. California Test Bureau, McGraw-Hill Book Co., Monterey, California.

Wechsler, D. Wechsler Intelligence Scale for Children - Manual. 1949. The Psychological Corporation, New York, N. Y.

Wrightstone, J. W., J. Justman, M. Pincus and R. H. Lowe. New York Test of Arithmetical Meanings. 1956. World Book Co., Yonkers-on-Hudson, N. Y.

APPENDIX A

Behavior Checklist

BEHAVIOR CHECKLIST

INSTRUCTIONS: Place one check mark in the margin opposite those items which are representative of this child's typical behavior. Use two check marks for those items which he shows more frequently. Use three check marks if the behavior item is most outstanding by its frequency.

N.B. The rater should be very familiar with the child's classroom behavior over a period of time. Take the average child in a regular classroom as your basis for comparison.

Name:________________________ Sex:____ Birth Date:______ Grade:____ Date:______ Teacher:________

1. Very sensitive to criticism.
2. Expresses feelings of inadequacy about self.
3. Never makes self known to others.
4. Is excessively neat or finicky about work or possessions.
5. Overconforms to rules.
6. Aggressive in underhanded ways.
7. Seeks attention excessively.
8. Very short attention span.
9. Can't work independently.
10. Shows signs of nervousness (nailbiting, crying, tics, rocking).
11. Overly preoccupied with sexual matters.
12. Daydreams.
13. Seems to fear being assertive even in ordinary ways (asking to go to toilet, defending self, making legitimate messes, joining in allowable noisy play).
14. Is receiving, or recommended, speech correction.
15. Poor coordination (trouble with buttoning, tying shoes, getting shoes on correct feet).
16. Can't take turns: "Me first."
17. Lacks responsibility for self, always has excuse for shortcomings.
18. Resists limits or rules in group games.
19. Tendencies toward enuresis or soiling of clothing.
20. Very messy with work or belongings.
21. Negativistic: "I won't."
22. Difficulty in handling working materials, such as crayons, scissors, paste, etc.
23. Considered an isolate in class.
24. Engages in much solitary play.
25. Displays infantile behavior (crawling, whining, clinging, sucking, chewing, etc.)
26. Makes odd noises.
27. Makes irrelevant or inappropriate remarks.
28. Misinterprets simple statements.
29. Is disoriented in space; is confused as to directions given.
30. Shows excessive fantasy preoccupation.
31. Tendencies toward primitive hostilities, temper tantrums, wild destruction.
32. Holds back in free play.
33. Antisocial tendencies (steals, lies, destroys property, bullies, defies, resents discipline).
34. Frequently tardy, frequently absent.
35. Poorly cared for before leaving for school.
36. Easily fatigued.
37. Often ill; other physical problems.
38. Feigns illness.
39. In academic area, evidence of underachievement, or overachievement, in relation to ability.

Reference: Emotionally Handicapped Children and the Elementary School. Eli Z. Rubin, Clyde Simson and Marcus Betwee, Wayne University Press, 1966.

APPENDIX B

Lafayette Clinic CPM Test Booklet

Manual of Instructions for Administration of Tests

INTRODUCTION TO MANUAL

One of the major products of this research is a battery of tests that allows for objective measurement of the cognitive, perceptual and motor dimensions considered significant for adaptation at school. Although the Lafayette Clinic Test Battery is not to be considered as a fully standardized test, it demonstrated its utility in this study as a means of identifying and describing children with high cognitive-perceptual-motor dysfunction. In a later phase of the study, the expectation that the battery selected those children most seriously in need of specialized intervention was confirmed.

The test battery, supplemented by other standardized tests, including an intelligence test, was used in comparing a sample of behaviorally-maladjusted children with a sample that was problem-free, comparable in age, sex distribution, socio-economic background and grade placement. The subjects ranged in age from six years and two months to twelve years and three months drawn in essentially equal groups from the regular 1st, 2nd, 3rd and 5th grades. Subjects with tested I.Q.s less than 81 were eliminated. There were 30 boys and 20 girls in each grade sample for both the experimental (maladjusted) and control (problem-free) groups. The findings from this comparison indicated that the experimental groups on the average performed less well on the cognitive-motor tasks than the control groups, with the latter showing very little dysfunction. However, the experimental groups did not uniformly show poor performance. Sixty percent performed very similarly to the control group. However, approximately 40% of the maladjusted subjects, at each grade level, demonstrated a low level of performance which was matched by only three subjects of the control groups. A cognitive-motor dysfunction score (the number of tests on which the subject scored below the criterion score) was used to separate subjects into high and low dysfunction groups.

These clear-cut findings suggest the usefulness of this instrument in identifying which maladjusted children have significant cognitive-motor dysfunction; i.e., the ones who can be considered the most suitable candidates for special programming. A refined battery, consisting of 20 tests, was delineated, retaining the items with the highest correlations with the total dysfunction score (see Table 21, Appendix C). Subsequently, using a multiple regression technique, a short form was arrived at retaining essentially the same effectiveness in identifying the high dysfunction subjects (see Table 16, page 40). The refined 20-test battery is probably the most effective instrument because it contains representative items from each cognitive-perceptual-motor area, providing information useful for educational planning.

SUGGESTIONS FOR ADMINISTRATION

The tests were devised to be objective measures, requiring a minimum of academic background of the examiner but depending heavily on training and experience in giving tests to disturbed children. The age norms available are limited because of the small sample size for each age group (Appendix D). Some investigators may wish to use the grade norms (Appendix D) which are based on larger samples and also supply the criterion scores for more tests that discriminated significantly between experimental and control groups. The normative tables are supplemented by the full tables of means and standard deviations for all the tests (see Tables 17-20, Appendix C).

Some of the tests utilized followed their source exactly (see pages 14-17); others vary from the source either in administration items or scoring. The materials necessary for administration were also derived from standardized tests, such as the visual test cards of Test III-A (Monroe Reading Aptitude). The materials for the visual perception tests (Tests I-E and I-F) involve the use of a paper tachistoscope whose source is the Durrell Analysis of Reading Difficulty.

TEST I-A
Visual Perception - Spatial Orientation

Directions (G): Read the directions as stated. Instruct subject in the use of the marker. All 20 items are administered.

SAY: Place your marker under the double line. On this page are some designs. Look at the first design in column A. (Point to the first design ⊓.) Can you find a design here (point down column B) that looks exactly like this one? (Have children answer.) Yes, it is this one. (Point to the ⊓ on the right.) Pick up your pencil now, and draw a line from this design to this one. (Point and draw while giving directions.) Do it now. Make your line touch the two designs that are the same.

Inspect children's work. See that each child has done the first practice item correctly before going on to the next. Help them draw the lines if necessary.

SAY: Now look at this design (Point to the ⊕.) Find the design that looks exactly like it and draw a line from this design to this one. (Now connect the two ⊕ 's with your pencil.)

Use the same directions for practice items c. and d. Inspect the children's work and assist them if necessary.

SAY: Now take your marker off the page. I want you to do all the rest of the designs in the same way. There are 2 pages. (Be sure that each child has the correct place.) Ready? Begin. (Make sure that child completes the items on page 2.)

At the end of exactly 2 minutes:

SAY: Stop. Put your pencil down.

TIMING: 2 minutes exactly.

SCORING: Each item is scored 1 or 0.

MAXIMUM SCORE: 20.

TEST I-B
Visual Perception - Form Discrimination - Simple

Directions (G): Read the directions as stated. Any mark such as a cross or circle is acceptable. All 25 items are administered.

SAY: Place your marker so that you can see just the first row of letters. Look at the first large letter, then find another which is just like it on this side (show). Put a mark on it.

Assist pupils in marking the 0 to the right of the vertical line. Explain that they are to mark a letter which is exactly like the first letter.

SAY: Now move your marker down. Find the letter or word over here (show column to right of double line) which is exactly like the one in the first column. Put a mark on it. Now move your paper down and do the rest in the same way. Now do all the rest on the page.

Encourage pupils to do all the items on this page. When pupils have completed the page or done all they are able to,

SAY: Now turn to the next page. (Pause.) Here are more words. Find a word which is just like the first word. Put a mark on it. Do all of these the same way.

In a group, the examiner may allow a pupil to turn to this last page as he completes the first.

TIMING: Approximately 5 minutes.

SCORING: Each item is scored 1 or 0.

MAXIMUM SCORE: 25.

TEST I-D

Visual Perception - Form Discrimination - Complex

Materials: Design Cards, Marker.

Directions (G): Cover the entire test page with the marker.

SAY: I am going to show you a card with a design on it. Look at it carefully and when I take it away, put an X on the one in the first row that is just like it. (Show Card A for 5 seconds, remove it and instruct the subject to expose the first row of designs.) Which one is correct? Yes, the 0 is the one I showed you. Mark it.

Now, we will do some more in the same way. Look at the design on this next card (Show Design #1 for 5 seconds and remove.) Move your marker and put an X on the one you saw.

(Examiner continues by exposing each card for 5 seconds, removing it and instructing the subject to move his marker and mark his response. Do all 10 items. Do not allow the next line to be exposed until after the card is removed.)

TIMING: No time limit.

SCORING: Each item is scored 1 or 0 .

MAXIMUM SCORE: 10.

TEST I-E

Visual Perception - Form Discrimination - Complex

Materials: Paper Tachistoscope, Word List A, Marker.

Directions (I): Put in the tachistoscope, without the shutter, the card with Word List A. Expose Word List in the Record Booklet, and direct him to put a marker under the first row of letters. Show the first letter in the tachistoscope, the letter f and:

SAY: See if you can find this letter in the first row. (If the child points to the right letter, tell him:) All right, now draw a circle around it. (If he is confused and does not pick the right letter, tell him:) Take another look at this letter (in the tachistoscope). Now see if you can find it. (Then have him draw a circle around it. After the first two items, warn him:) From now on, you can have only one look. Be sure to look carefully when I show you the word. Do not move your marker until I take the word away.

Show the child the letter or word for about two or three seconds, long enough for him to get a good look at it. Usually the child will take a quick look: then turn to the Record Booklet, move the tachistoscope card to the next word.

TIMING: No time limit.

DISCONTINUE: 4 consecutive failures.

SCORING: Each item is scored 1 or 0, including the example.

MAXIMUM SCORE: 20.

TEST I-F

Visual Perception - Form Discrimination - Complex

Materials: Paper tachistoscope, Word Lists B and C.

Directions (I): Subjects in Grades 1-3: Begin with the first letter of Word List B. Give the entire list until the child fails 3 words in a row. If he finishes List B, continue with List C. Failure is defined below as 1/2 credit or less per item.

Place in the tachistoscope the card with Word List B. Do not use the shutter. Show the child the first letter for two or three seconds.

SAY: Look at this letter (remove card after 2 or 3 seconds). Now write it beside no. 1 in the booklet in this column (indicate column).

Do not pronounce the letter or ask the child to read it. As soon as the child has looked at the letter, remove the card and have him write it from memory. Do not allow time to repeat the letter subvocally, but if the child does so make note of the fact. Show child the next 2 items in same way.

Subjects above 3rd grade: Begin with the first 5 items of List B. If subject makes any error, continue with List B as with the younger child. If the subject completes the first 5 without error, proceed to List C. If he misses full credit on any of the first 3 on this list, turn back to List B and continue until 3 consecutive failures.

SAY: Look at this word (remove card after 2 or 3 seconds). Now write it beside no. 1.

TIMING: No time limit.

DISCONTINUE: After 3 consecutive failures. A word is failed if the score obtained is equal to 1/2 or less of the total credit.

SCORING: Each correct letter in proper place is given 1 credit and the sum for each word is totaled. One-half credit is subtracted for each letter omitted, added, or out of place by 1 position, but do not penalize for incorrect portion of letters in the rest of the word. No credit is given or subtracted for an incorrect letter replacing a stimulus letter. Subtract 1/2 credit for letters added to the total word but do not subtract points for letters omitted at the end of the word. If the word can be scored two ways, give the larger score. Partial credit received for the last 3 consecutive failures is added to the total score.

For subjects above 3rd grade: If the first 5 items of List B are all correct and no errors on the first 3 items of List C, give full credit for Test B (99 points). If the subject makes any error on the first 3 of List C, and subsequently fails 3 items in a row on List B, then the items passed in List C are not included in the final score.

Scoring examples:

Stimulus word	Response	Score
come	cone	3
name	naem	2 1/2
chair	chai	4
canalize	canalized	7 1/2
thorough	through	6 1/2
thorough	thorght	4 1/2
different	diffe	5
photograph	photografe	8

TEST II-A
Auditory Perception - Sound Discrimination

Materials: Binet cards (a) and (b); tape recorder.

Administration (I): In order to eliminate visual cues, and to reduce variations introduced by voice quality or accents of different examiners, it is desirable to present this test by means of a tape, pre-recorded by a person with a clear, deep voice. Otherwise, the child should be placed so that he faces away from the examiner.

It is important that the subject understand the directions clearly. Young children in particular may not clearly comprehend what is meant by "same" or "different". The following introduction is used to explain these concepts.

Present card (a).

SAY: See these two trees? They are the same, aren't they? Just the same. (Then show card (b).)

SAY: But these two aren't alike (pointing), one is round and one is square. They are different, aren't they?

I am going to say two words. Sometimes the words will be the same; then you say "same". Sometimes parts of the words will be the same but other parts will be different. Then you say, "different". Let's try some words.

Practice items: (Examples)

"ma - pa" (Are these same or different? Different)

"boy - toy" (Are these same or different? Different)

"dog - dog" (Are these same or different? Same)

"tune - loon" (Are these same or different? Different)

"cat - cat" (Are these same or different? Same)

The practice items may be repeated, as needed, to be sure the subject understands.

TEST II, A (continued) - page 2

SAY: Here are some more words (read items, pausing to allow a response. Repeat directions "Are these the same or different" as needed. It is not permissible to repeat the word-pair once given.).

Items

1. tin - thin
2. late - date
3. pig - big
4. (gun - gun)
5. test - text
6. bud - bug
7. chip - ship
8. habitat - habitant
9. sop - shop
10. conical - comical
11. (hoe - hoe)
12. beats - beads
13. cytology - psychology
14. class - clasp
15. mush - much

Items

16. patriarch - matriarch
17. (peach - peach)
18. wear - where
19. biscuit - brisket
20. foal - stole
21. pass - path
22. convergent - conversant
23. falls - false
24. (at - at)
25. refracted - retracted
26. coke - cope
27. carrion - Marion
28. (far - far)
29. frisking - whisking
30. thigh - sigh

TIMING: No time limit.

SCORING: Each item is scored 1 or 0. Record incorrect responses and no responses for qualitative analysis only.

MAXIMUM SCORE: 30.

TEST II-B
Auditory Perception - Sound Discrimination - Complex

Materials: Tape recorder, marker.

Administration (G): Read the directions as stated with the subject facing away from the examiner. Use of a pre-recorded tape is desirable. Proceed at a rate that allows all the subjects to keep up. In group testing, examiner must circulate to insure that each subject is on the correct item. Emphasize clearly which sound is sought for each section.

BEGINNING LETTER

SAY: Look at the row of things at the top of the page. Put your marker under the first row of things. Put your finger on the one in the box. We are going to find something over here (demonstrate those pictures to the right of the box) which starts with the same sound as the thing in the box.

A. Look at the leaf in the box. Now look along the row. What starts with the same sound as leaf: is it drum, horse, lamp, or cat? (Encourage a verbal response.)

Yes, lamp starts with the same sound as leaf, so put a mark on the lamp. (Check to see that child has marked the correct picture.) I'll say the name of the thing in the box, then name the other things along the row. You are to put a mark on the thing in each row that starts with the same sound as the thing in the box.

1. Move your marker to the next row of pictures. Look at the rabbit in the box. Now look along the row. What starts with the same sound as rabbit? Is it: fish, hammer, chimney, or rake? Put a mark on it.

2. Move your marker to the next row. Look at the table in the box. Now look along the row. What starts with the same sound as table? Is it: bed, turtle, nail, or pipe?

(continued on next page)

TEST II, B (continued) - page 2

BEGINNING LETTER (continued)

3. Move your marker to the next row of pictures. Look at the goat in the box. Now look along the row. What starts with the same sound as goat? Is it: basket, fountain, cane or gate?

4. Move your marker to the next row. Look at the key in the box. Now look along the row. What starts with the same sound as key? Is it: pumpkin, faucet, kite, or mirror?

FINAL SOUND

SAY: Turn the page. Look at the row of things at the top of the page. Put your marker under the first row of things. Put your finger on the one in the box. We are going to find something along the row which ends with the same sound as the thing in the box.

B. Look at the cat in the box. Now look along the row. What ends with the same sound as cat? Is it: table, pipe, key, or hat? (Encourage a verbal response.)

Yes, hat ends with the same sound as cat, so put a mark on the hat. (Check to see that child has marked the correct picture.)

5. Move your marker to the next row of pictures. Look at the dog in the box. Now look along the row. What ends with the same sound as dog? Is it: saw, pig, rake, or turtle? Put a mark on it.

6. Now move your marker to the next row. Look at the lamp in the box. Now look along the row. What ends with the same sound as lamp? Is it: sheep, leaf, barn, or faucet? Put a mark on it.

7. Move your marker to the next row. Look at the hammer in the box. Now look along the row. What ends with the same sound as hammer? Is it: cheese, rabbit, flower, or apple? Put a mark on it.

8. Move your marker to the next row. Look at the book in the box. Now look along the row. What ends with the same sound as book? Is it: ball, drum, cane, or sink?

(continued on next page)

INITIAL BLEND

SAY: Turn the page. Look at the row of things at the top of the page. Put your marker under the first row of things. Put your finger on the one in the box. We are going to find something along the row which begins with the same sound as the thing in the box.

C. Look at the star in the box. Now look along the row. What begins with the same sound as star? Is it: pumpkin, rabbit, stamp, or fountain? (Encourage a verbal response.)

Yes, stamp begins with the same sound as star, so put a mark on the stamp. (Check to see that child has marked the correct picture.

9. Now move your marker to the next row of pictures. Look at the chimney in the box. Now look along the row. What begins with the same sound as chimney? Is it: hat, hammer, money, or church? Put a mark on it.

10. Move your marker to the next row of pictures. Look at the tree in the box. Now look along the row. What begins with the same sound as tree? Is it: box, duck, nail, or truck? Put a mark on it.

11. Move your marker to the next row of pictures. Look at the sled in the box. Look along the row. What begins with the same sound as sled? Is it: bottle, door, slide, or leaf? Put a mark on it.

12. Move your marker to the next row. Look at the flag in the box. Now look along the row. What begins with the same sound as flag? Is it: barn, flower, hat , or fish? Put a mark on it.

RHYMING

SAY: Turn the page. Look at the row of things at the top of the page. Put your marker under the first row of things. Put your finger on the one in the box. We are going to find something along the row that rhymes with (has the same ending sound as) the thing in the box.

(continued on next page)

RHYMING (continued)

SAY:

D. Look at the swing in the box. Now look along the row. What rhymes with (ends with the same sound as) swing? Is it: sled, ring, box, or bottle? (Encourage a verbal response.)

Yes, ring rhymes with (has the same ending sound as) swing, so put a mark on it. (Check to see that the child has marked the correct picture.)

13. Now move your marker to the next row of pictures. Look at the lamp in the box. Now look along the row. What rhymes with (ends with the same sound as) lamp? Is it: faucet, moon, rabbit, or stamp? Put a mark on it.

14. Move your marker to the next row. Look at the clock in the box. Now look along the row. What rhymes with (ends with the same sound as) clock? Is it: sheep, sock, hammer, or leaf? Put a mark on it.

15. Move your marker to the next row. Look at the fish in the box. Now look along the row. What rhymes with (ends with the same sound as) fish? Is it: dish, pumpkin, chimney, or house? Put a mark on it.

16. Move your marker to the next row. Look at the vest in the box. Now look along the row. What rhymes with (ends with the same sound as) vest? Is it: box, drum, chest, or cat? Put a mark on it.

FINAL BLEND

SAY: Turn the page. Look at the row of things at the top of the page. Put your marker under the first row of things. Put your finger on the one in the box. We are going to find something along the row that has the same ending sound as the thing in the box.

E. Look at the church in the box. Now look along the row. What ends with the same sound as church? Is it: sink, drum, cat, or bench? (Encourage a verbal response.)

(continued on next page)

FINAL BLEND (continued)

SAY: Yes, bench has the same ending sound as church, so put a mark on it. (Check to see that child has marked the correct picture.)

17. Move your marker to the next row. Look at the cabbage in the box. Now look along the row. What ends with the same sound as cabbage? Is it: leaf, box, pipe, or hinge? Put a mark on it.

18. Move your marker to the next row. Look at the comb in the box. Now look along the row. What ends with the same sound as comb? Is it: thumb, faucet, gate, or sled? Put a mark on it.

19. Move your marker to the next row. Look at the crutch in the box. Now look along the row. What ends with the same sound as crutch? Is it: pig, mirror, rake, or porch? Put a mark on it.

20. Move your marker to the next row. Look at the fist in the box. Now look along the row. What ends with the same sound as fist? Is it: chimney, chest, box, or hat? Put a mark on it.

LONG VOWEL

SAY: Turn the page. Look at the row of things at the top of the page. Put your marker under the first row of things. Put your finger on the one in the box. We are going to find something along the row that has the same middle sound as the thing in the box.

F. Look at the wheel in the box. Now look along the row. What has the same middle sound as wheel? Is it: lamp, pig, leaf, or moon? (Encourage a verbal response.)

Yes, leaf has the same middle sound as wheel, so put a mark on it. (Check to see that child has marked the correct picture.)

21. Move your marker to the next row. Look at the knife in the box. Now look along the row. What has the same middle sound as knife? Is it: rabbit, pipe, barn, or turtle? Put a mark on it.

(continued on next page)

LONG VOWEL (continued)

SAY:

22. Move your marker to the next row. Look at the cake in the box. Now look along the row. What has the same middle sound as cake? Is it: pitcher, drum, ring, or gate? Put a mark on it.

23. Move your marker to the next row. Look at the nose in the box. Now look along the row. What has the same middle sound as nose? Is it: slide, comb, bed, or whistle? Put a mark on it.

24. Move your marker to the next row. Look at the cube in the box. Now look along the row. What has the same middle sound as cube? Is it: truck, flute, ship, or cheese?

MIDDLE SHORT VOWEL

SAY: Turn the page. Look at the row of things at the top of the page. Put your marker under the first row of things. Put your finger on the one in the box. We are going to find something along the row that has the same middle sound as the thing in the box.

G. Look at the hat in the box. Now look along the row. What has the same middle sound as hat? Is it: drum, lamp, bottle, or horse? (Encourage verbal response.)

Yes, lamp has the same middle sound as hat, so put a mark on it. (Check to see that child has marked the correct picture.)

25. Move your marker to the next row. Look at the sled in the box. Now look along the row. What has the same middle sound as sled? Is it: vest, plane, fountain, or moon? Put a mark on it.

26. Move your marker to the next row. Look at the fish in the box. Now look along the row. What has the same middle sound as fish? Is it: tree, nail, pig, or barn? Put a mark on it.

(continued on next page)

TEST II-B (continued) - page 7

MIDDLE SHORT VOWEL (continued)

27. Move your marker to the next row. Look at the sock in the box. Now look along the row. What has the same middle sound as sock? Is it: plane, key, pipe, or bottle? Put a mark on it.

28. Move your marker to the next row. Look at the duck in the box. Now look along the row. What has the same middle sound as duck? Is it: cane, gun, chimney, or candle? Put a mark on it.

TIMING: No time limit.

SCORING: Each item is scored 1 or 0.

MAXIMUM SCORE: 28.

TEST III-A
Visual Memory - Form

Materials: Visual Test Cards.

Administration (G):

SAY: We are going to draw some designs. I will show you some cards with designs on them. Look carefully at each card but do not draw anything because I am going to take the card away and then you can draw what you saw. Here is the first card.

(Expose the first card for exactly 10 seconds and remove.)

SAY: Now, draw what you saw on line 1.

Proceed in the same manner with the remaining cards. Be sure to indicate the number of the card to be presented and the number of the line on which to draw.

TIMING: No time limit.

SCORING: A score of 1 is given for each correct element on a card. One-half credit is removed for each error, e.g. rotation, incorrect order, omission of part of figure. Two or more errors per element scores no credit. Credit is not removed for poor motor performance.

See Appendix A for scoring examples.

MAXIMUM SCORE: 24

TEST III-B
Auditory Memory - Immediate Meaningful

Administration (I): The examiner will use the forms from the test booklet to record subject's responses. Use the graded paragraph appropriate to the subject's current grade placement.

SAY: I am going to read a little story. Listen carefully, and when I am through I will ask you to tell me the story.

(Read the story with expression.)

SAY: Now you tell me the same story. (Underline the ideas reproduced by the child.)

When finished, turn pages over then return booklet to child and begin next test.

TIMING: No time limit.

SCORING: Give 1 credit for each element reproduced. Scoring is somewhat lenient, accepting a response as correct if it contains the main idea. Credit is not given for gross inaccuracies, e.g. "a mother hen/had 2/baby chicks." No credit is given for "2". Total raw score is divided by maximum score for paragraph used and expressed as a proportion.

MAXIMUM SCORE:
Grades I - II = 21
Grades III-IV = 20
Grades V - VI = 38

TEST III-C
Auditory Memory - Immediate Meaningful

Administration (I): Begin with the paragraph equivalent to child's current grade placement. If he is correct on all, or all but 1, of the questions, continue with the succeeding paragraphs until two questions are failed. If the subject fails 2 questions at his own grade, administer the preceding paragraphs in reverse order until child gets less than 2 questions wrong.

SAY: I am going to read a story out loud to you; then I will ask you questions about it. Be sure to listen carefully so that you can answer the questions. This first story is about --- (give title).

(Read the story in a normal voice, with normal speed and expression. Look at the child while you read and try to hold his attention, but do not overdramatize the selection.)

Administer the questions immediately following each paragraph.

SAY:

GRADE 1. THE CAT AND THE DOG

A boy had a big gray cat. He was going to give her some milk. She did not come when he called. He saw her up in a tree looking down at a big dog. The boy sent the dog away. Then the cat jumped down from the tree and came for her milk.

GRADE 2. DICK'S BIRTHDAY PRESENT

Dick jumped out of bed and ran downstairs. It was his birthday. He found a big basket on his chair at the table. Something was moving in the basket. Dick took off the cover. Out jumped a little brown dog. The dog started to bark and wag his tail. He was glad to get out.

(continued on next page)

SAY:

GRADE 3. THE ACCIDENT

A boy was hurt on our street yesterday. He had been playing ball and was riding his bicycle away from the ball field when a car came down the road. He did not see the car coming because he was looking back at the boys who were still playing ball. The car was going slowly. It hit the boy, but did not run over him. His arm was hurt and his bicycle was bent.

GRADE 4. PETER COOPER'S ENGINE

Peter Cooper built one of the first railroad engines in the United States. It was used to pull cars from a city to a town thirteen miles away. No one thought that the engine could do this. In August in the year 1830, it was hooked to a car packed full of people. It went at a speed of eighteen miles an hour and made the trip in forty-eight minutes. People were surprised that anyone could breathe while going so fast.

GRADE 5. USES OF KITES

Large kites have been used for a great many things. In war they have been used to carry signal lanterns and to carry automatic cameras over enemy territory. One general used kites to pull ropes across a swift river so that he could start to build a swinging bridge. Some people in China make "singing kites" which are supposed to frighten away evil spirits. The weather bureau has used kites to study temperature and the speed of the wind at great heights. A string of kites once went up over four miles in the air. Some kites are big enough to lift a man.

(continued on next page)

SAY:

GRADE 6. HISTORY OF BASEBALL

Baseball is called the national sport. It developed from games known as "rounders" and "town ball." It was played in colleges as early as 1825 and its popularity has constantly increased. It is easily understood and demands simple equipment. Curiously enough, war has been responsible for the growth of the pastime. Men learned it in camps during the Civil War and organized teams on returning home. The World War extended it further. Wherever American soldiers have been stationed they have created an interest in baseball which remained after the men departed. Both amateur and professional players welcome the baseball season.

GRADE 7. GENERAL ST. CLAIR'S DEFEAT

Failure to plan for suitable defense under irregular conditions of warfare accounted for defeat in the first war waged by the United States. An army of two thousand men under General Arthur St. Clair marched northward from Cincinnati to punish Indians who had broken treaty provisions. They neglected to guard against unexpected assault and found themselves defenseless when hostile Indians suddenly attacked them in the forest. Firearms gave little protection against an enemy in ambush. After a futile attempt at defense, St. Clair ordered his men to retreat. Only fifty escaped uninjured. President Washington felt very bitter about St. Clair's carelessness in the country's first military campaign.

TIMING: No time limit.

SCORING: Score 1 credit for each correct answer. Full credit is given for all questions below the basal paragraph, i.e, not more than 1 incorrect answer. The score is a cumulative one, beginning with grade 1 up through and including partial credit on highest paragraph with 2 or more failures.

MAXIMUM SCORE: 54

TEST III-E

Memory - Delayed Meaningful

Directions (G): Read the directions as stated. Child is not presented with answer pictures until after another test has been interpolated. Interpolate test III-A or other non-verbal test:

SAY: I am going to read a little story. I want you to listen because I am going to ask you some questions about it after a while.

READ (with expression):

Saturday at the Park

Once there was a little girl named Jean and a little boy called Bobbie. One Saturday their father said he would take them to the park. They went on the bus. Jean wanted to put the money in the fare box and Bobbie wanted to put the money in, too. Father said, "No, Bobbie, you are too little. Let Jean do it." So father gave Jean the money and she dropped it into the box as soon as they got on the bus. On the way to the park they passed many things. On one corner they saw a little black and white dog. "When we come home, let's stop and buy him," said Bobbie. But Daddy just said, "We have one dog and that is enough."

When they got to the park, Bobbie and Jean both wanted to ring the bell to make the bus stop. Father said, "Your turn this time, Bobbie." So father lifted Bobbie up to the bell and Bobbie pulled the cord. The bus stopped and there they were at the park. Right at the gate to the park there was a man with a peanut stand. The children could smell the peanuts roasting. "Oh, I am so hungry for some nice roasted peanuts," said father. So he got bags of peanuts for everyone.

This park was like a zoo. There were monkeys, elephants, bears, and other animals for children to see. The children went to every cage and watched the animals.

At last they came to the bears. There were white bears, brown bears, and one big black bear and a baby bear. Father said, "Hey, Big Boy! Catch this peanut!" He threw the peanut to the bears. Then Jean and Bobbie threw some peanuts. Sometimes the bears would catch them and sometimes the peanuts would fall on the floor of the cage. If a peanut went in the water the bears would swim and get it. What a time they had at the park!

Finally they got home. Soon the children heard the doorbell. Uncle Bill had come to supper. Uncle Bill was a big, jolly man. He sat down and listened while Jean and Bobbie told him about the park. Bobbie played he was a monkey. He did funny things. Uncle Bill just laughed and laughed. How he did laugh! He kept on laughing 'til mother called them all to supper.

They had a very good supper that night. Mother had made huckleberry pie and they had it for dessert. Uncle Bill liked the pie the best of anything they had for supper. "You know I like pie," he said. "And I do like pie!" They had a fine time that Saturday. Didn't they!

Examiner: The questions for this test will be administered after interpolated test is given.

- - - - - - - - - - - - - - -

INTERPOLATE TEST

SAY: Look at the pictures. Some of them are about the story I told you. Do you remember the story about Jean and Bobbie?

SAY: Look at the row of pictures at the top of the page. Put your marker under the first row of pictures. Now take your pencil.

1) Mark the thing the children went on when father took them to the park. (A pause.) If you cannot remember, wait until I tell you what to do next. Move your marker to the next row of pictures.

2) Mark the one who put the fare in the box. (Pause.) Move your marker under the next row of pictures.

3) Mark the thing Bobbie wanted his father to buy. (Pause.) Move your marker under the next row.

4) Mark the one who rang the bell when they got off at the park. (Pause.) Move your marker under the next row.

5) Mark the animals the children fed. (Pause.) Now turn your book over and put your marker under the first row of pictures at the top of the page.

6) Mark what Uncle Bill did when Bobbie played he was a monkey. (Pause.) Move your marker under the next row.

7) Mark what Uncle Bill liked best for supper. (Pause.)

TIMING: No time limit.

SCORING: Each item is scored 1 or 0.

MAXIMUM SCORE: 7.

TEST IV-A
Orientation - Time

Directions (I): The child is asked all 30 questions.

SAY: 1) How old are you now? CURRENT WHOLE YEAR

2) When is your birthday? EXACT

3) Have you ever seen me before? ____

4) Have you ever seen me before you came to this place? ____

5) How old am I? WITHIN 10 YEARS

6) What day is it today? EXACT

7) What day was it yesterday? EXACT

8) What day will it be tomorrow? EXACT

9) What is the name of this place? NAME OF PLACE - IF SCHOOL - NAME OF SCHOOL

10) What kind of place is it? SCHOOL - TYPE OF PLACE

11) What time do you eat breakfast? BEFORE 8:15

Lunch? 12-1 Dinner? 5-8

12) What part of the day is it? (Morning, afternoon or evening? EXACT

13) What time is it? ALLOW ANSWER WITHIN ONE HOUR

14) Where are you now? NAME OF ROOM - LIBRARY, ETC. - OR - NAME OF SCHOOL - OR - PLACE

15) Is there another? (Name of place of testing) USUALLY NO! "MAYBE" ACCEPTABLE

16) How long have you been going to school here?

TO NEAREST MONTH, YEAR.

17) Have you been in another? (USE NAME OF PLACE)

____

18) Where do you live? (Address) HOUSE # AND STREET

19) How long does it usually take for you to get home from school? (20-30 MIN. AS A MAXIMUM)

20) Where is your school? (Address) STREET NAME OR CITY

21) How far from school do you live? NUMBER OF BLOCKS OR REASONABLE DISTANCE (1/2 to 3/4 MILE) -- IF MORE THAN 3/4 MILE ASK "DO YOU WALK?" -

IF YES - MARK WRONG

22) How long does it take for you to get to school from home? ANSWER APPROXIMATELY SAME AS 19

23) Name the days of the week (NOT HAVE TO BE IN ORDER)

ALL 7 REQUIRED

24) What day comes just before Friday?________________

Tuesday?________________ Wednesday?________________

25) What day comes just after Sunday?________________

Thursday?________________ Wednesday?________________

26) Name the months of the year________________

(NOT HAVE TO BE IN ORDER) ALL 12 REQUIRED

27) What month comes just before September?____________

January?________________ June?________________

28) What month comes just after November?_______________

August?__________________ February?__________________

29) In what month does summer begin? JUNE

30) During which season do we have Halloween?

FALL, AUTUMN

TIMING: No time limit.

SCORING: Each item is scored 1 or 0. The examiner should adjust the answers to the item - 16 and 17 - to conform to local conditions.

MAXIMUM SCORE: 30.

TEST IV-B
Orientation - Size

Directions (G): Read the directions as stated. Begin with item 1 and do not give any help.

SAY: 1) Put a mark on the tallest boy. (Pause.)

2) Put a mark on the largest dog. (Pause.)

3) Put a mark on the two little chickens. (Pause.)

SAY: TURN PAGE:

4) Look at the tables at the top of the page. (Pause briefly.) John uses the smallest table to draw on. Make a cross on the table that John uses. (Pause about 15 seconds for this item and each of the following items.)

5) Look at the 4 dolls in the next row. (Pause.) Jane's Daddy bought her the largest doll. Make a cross on Jane's doll.

6) Now look at the mittens Mother washed. (Pause.) Make a cross on baby's pair of mittens.

7) Look at the baseball bats. (Pause.) My brother plays ball with the longest bat. Make a cross on my brother's bat.

SAY: TURN PAGE:

8) Now look at the pile of sand, the pile of bricks, the pile of rubber balls, and the pile of rocks. (Pause.) Make a cross on the pile which is lightest. (Pause about 15 seconds after each item.)

9) Look at the clothespin, the cookie, the spool, and the orange. (Pause.) Make a cross on the one which is heaviest.

10) Look at the men walking across the ropes. (Pause.) Make a cross on the man who is heaviest.

11) Look at the boys pulling the carts. (Pause.) Which cart has the lightest package? Make a cross on it.

12) Look at the jars of paint. (Pause.) Tony used the jar with the most paint in it. Make a cross on that jar. (Pause about 15 seconds after each item.)

13) Look at the boxes of crayons. (Pause.) Some crayons fell out of the boxes. Make a cross on that box.

14) Look at the bookshelves. (Pause.) Make a cross on the shelf that has only a few books on it.

15) Look at the wooden beads. (Pause.) Mary wants to put them on strings. Make a cross on the pile of beads which will need the longest string.

16) Look at the scales. (Pause.) Make a cross on the lightest bundle of wash. (Pause about 15 seconds after each item.)

SAY: TURN PAGE:

17) Look at the bowl of fish. (Pause briefly.) Make a cross on the largest fish in the bowl.

18) Look at the three shelves in the closet. (Pause.) Make a cross on the boxes of food on the lowest shelf.

TIMING: No time limit.

SCORING: Each item is scored 1 or 0. Do not penalize for use of mark other than cross.

MAXIMUM SCORE: 18.

TEST IV-C
Orientation - Midline

Directions (I): Seat the child facing the examiner, who is also seated. Do not demonstrate.

SAY: Here are some more things for you to do.

1) Put one hand on your cheek, and now put the same hand on the other cheek.

2) Put one hand on your leg, and now put the same hand on the other leg.

3) Put one hand on your ear, and now put the same hand on the other ear.

TIMING: No time limit.

SCORING: Score 2 points if subject uses same hand without hesitation; 1 point if he starts to use other hand but does not; 0 points if other hand is used or same hand is placed on same cheek, leg, or ear.

MAXIMUM SCORE: 6.

TEST IV-D
Orientation - Space

Directions (G): Read the directions as stated. Begin with item 1 without demonstration. Alert the subject to listen carefully to each question.

SAY: 1) Look at the toy merry-go-round. Now look at the boxes. (Pause.) Jerry keeps his merry-go-round in one of the boxes. Make a cross on that box.

2) Look at the sailboats. (Pause.) These boats are all the same size. Make a cross on the boat that is farthest away.

3) Look at the umbrella. (Pause.) Now look at the boxes beside it. Make a cross on the box we could use for the umbrella.

4) Look at the cake. (Pause.) Now look at the pans beside it. Sally baked this cake. Make a cross on the pan she used.

SAY: TURN PAGE:

5) Make a cross on the bird which is above the swings. (Pause about 15 seconds after each item.)

6) Look at the swings. Make a cross on the middle swing.

7) Make a cross on the ball under the bench.

8) Look at the sandbox. Make a cross on the pail between the children.

9) Make a cross on the bicycle nearest the swings.

10) Make a cross on the child behind the bench.

SAY: TURN PAGE:

11) Look at the flower box. (Pause.) Make a cross on the plant in the center of the flower box.

12) Now make a cross on the puppy nearest the door. (Pause.)

13) Look at the turtles in the tank. (Pause.) Make a cross on the turtle to the right of the rocks.

SAY: TURN PAGE:

14) Put a mark on the cat which is in the middle. (Pause.)

15) Put a mark on the man who is farthest away. (Pause.)

16) Put a mark on the girl who has something you can see in her left hand.

TIMING: No time limit.

SCORING: Each item is scored 1 or 0.

MAXIMUM SCORE: 16.

TEST IV-F

Orientation - Space

Directions (I): Seat the child at the table opposite the examiner. Read the questions as stated.

1) Show me which way is right.________________

2) Show me which way is left.________________

3) Show me which way is up.________________

4) Show me which way is down.________________

5) Am I sitting in front of you or in back of you?________

6) (Place two objects in front of the child; one close, one farther away, and then ask) Which one is closer to you?________________

7) Which one is farther from you?________________

8) Touch your fingers together over your head.________

9) Touch your fingers under your chair.____________

10) Where does the sun rise?________ (EAST) ________

FOR ITEMS 10, 11, 12: IF THE SUBJECT POINTS, SAY "WHAT DIRECTION IS THAT?"

11) In what direction would you have to travel from here to California?________ (WEST) ________

12) In what direction would you have to travel from here to New York?________ (EAST) ________

TIMING: No time limit.

SCORING: Each item is scored 1 or 0.

TEST V-A
Integration - Non-Verbal

Materials: Jigsaw puzzles A and B.

Directions (I): Grades 1 and 2 - Puzzle A

Grades 3 and 5 - Puzzle B

All children are given the appropriate puzzle assembled, asked to take it apart and assemble it outside the frame.

SAY: I want you to take all of the pieces out, mix them up and put them back together just as you see them now. Work as quickly as you can.

Begin timing when child starts to assemble puzzle.

TIMING: Puzzle A: Maximum 300 seconds.

Puzzle B: Maximum 600 seconds.

SCORING: **TIME SCORE:** Record in seconds the time it takes the child to complete the task. Observe the maximum in scoring. Time in seconds is converted to normalized score by the following:

METHOD SCORE: Observe and record the method child uses to complete the task.

Score 1 point if child completes task using no organization except trial and error.

Score 2 points if child completes the task using visual cues in addition to trial and error.

Score 3 points if child uses boundaries, corners, visual cues, etc., to organize the task.

MAXIMUM SCORE:

TIME SCORE: Grades 1 and 2: 300 seconds

Grades 3 and 5: 600 seconds

METHOD SCORE: 3.

TEST V-B
Integration - Symbolic
(California Test of Mental Maturity)

Materials: Test I, Kg. is used for 1st grade subjects.

Test I, 1-3 is used for 2nd & 3rd grade subjects.

Test I, 4-8 is used for 5th grade subjects.

Directions (G): Choose the appropriate test form and read the directions as stated:

TEST I, Kg.

SAY:

You are to find something in each row that is like the first two pictures and put a mark on it. Place your marker so you can see only the first row of pictures. The sweater, shoes and cap are alike because they are all something to wear. That is why you mark the cap. Put a mark on the cap in the first row.

Now move your marker down to the next row so you can see the sun, moon, and other drawings. Put a mark on the picture that goes with the sun and moon. (Pause.) The light bulb is the right one.

Do the others in the same way. Put a mark on the picture that is like the first two pictures in each row.

You may begin.

TIMING: Stop at the end of 4 minutes.

TEST I - 1-3 Grades

SAY:

Place your marker so that you can see only the first row of pictures. You are to find something in each row that is like the first two pictures and put a mark on it. (Demonstrate.)

Put a mark on the coat in the first row. The pants, sweater, and coat are alike because they are all something to wear. That's why you mark the coat.

TEST I - 1-3 Grades (continued)

Now move your marker down so you can see the toy wagon, top, and other drawings. Which of these three pictures goes with a toy wagon and a top? (Let the pupil answer.) Yes, ball. The toy wagon, top, and ball are alike because they are all toys. Put a mark on the ball.

(The examiner should check to see that samples I and J have been marked.)

SAY: Now do the others in the same way. Use your marker if you wish. Put a mark on the picture that goes with the first two pictures in each row. You may begin.

(After 2 minutes.)

SAY: Be sure to do all 3 pages.

TIMING: Stop at the end of 4 minutes.

TEST I - 4-8 Grades

SAY:

Place your marker so that you can see only the first row of pictures.

The first three pictures in each row are alike in some way. Decide how they are alike, and then find the one picture among the four to the right of the dotted line that is most like them and mark its number.

Look at the pictures in row G. In what way are the first three pictures alike? (Let the pupils answer.) Yes, they are all pictures of things to wear. Now look along row G to the right and find a picture of something else like them. Number 2,

TEST I - 4-8 Grades (continued)

the sweater, is the right picture because it is also something to wear. Therefore, a 2 should be written on the line to the right just in front of the capital G. (Lower right hand corner.) Do it now.

Now do as many as you can beginning with row number 1.

You may begin.

(After 2 minutes.)

SAY: Be sure to do all 3 pages.

TIMING: Stop at the end of 5 minutes.

SCORING: Each item is scored 1 or 0. The raw score is converted to a proportion of the maximum score for each.

MAXIMUM SCORES:

Kg: 6.

1-3: 12.

4-8: 16.

TEST V-C
Integration - Symbolic

Directions (I): Read the directions as stated.

SAY: Name all the animals you can think of as quickly as you can.

Examiner allows 30 seconds, recording the number of different animals named in that time. Examiner may encourage one time only if subject stops before 30 seconds:

SAY: Any more?

Repeat instructions for:

Things to eat.

Toys.

TIMING: Allow 30 seconds for each category.

SCORING: Total number of items named for all categories.

TEST V-D
Integration - Inferential Reasoning

Directions (G): Read the directions as stated.

SAY: I will show you some pictures and tell you something about them. Listen carefully. When I finish reading, mark your booklet.

SAY:

1) Here are some toys for children. Draw a line under one toy that you think most girls would like best.

2) One of these three things can take you to camp. Draw a line under it.

3) Elsie learned that plants always grow toward the light. To test this, she put her geranium plant between two windows. She kept one window shade pulled down so no light could get in. Draw a line from the geranium to the window that it will lean toward.

4) Joe and Jean are going out to play in the snow. As they open the front door, Mother asks from the next room, "Are you children dressed warmly enough?" They answer, "Yes, Mother." Put a line under the kind of clothing they are wearing.

5) Until recently, all milk containers were made of metal or glass. They could be used many times, but washing and returning them was a bother to customers. Waxed cartons which can be thrown away, are less work. Put an X on the most convenient container.

SAY: TURN YOUR PAGE IN THE BOOKLET:

6) Fred is going to build a model airplane. The wooden parts of the plane, a knife to shape them, and glue to hold them are all together on the table where they will be handy. As he begins to work, he finds something in his way. Put an X on it.

7) There are different kinds of horses for different jobs. The Percheron is a huge, strong horse that is used for heavy work. For riding, the fast sensitive Arabian horse is better. Draw a line from the rider to the horse he will probably ride.

8) Apples and pears grow on trees. Bananas, too, grow on tall tree-like plants. Most berries grow on low bushes, and some berries grow very close to the ground. Draw a line to separate the tree fruits from those that grow closer to the ground.

9) One of these boys will go to camp for the summer. Another boy will go to sea. Draw a line under the one who will go to camp for the summer.

10) Different coins are used in the different countries of the world. In Italy they use the lira, in Mexico they use the peso, in England they use the shilling, in Switzerland they use the franc, and in the United States they use the quarter. If you were traveling in New York City, what money would you use? Mark an X on it.

SAY: Now I will read some stories. Listen carefully. At the end of each story I will ask you a question and say some words which answer the question. You are to choose the word which best answers the question about the story. Let's try an example. Turn your page.

Read each story in a clear, interest-holding voice. Then read the answer choices, giving each equal emphasis. The answer choices may be repeated.

PRACTICE ITEM:

SAY: Let's do this one together.

SAY: The sun is hot. Boys and girls like to swim and play games on the grass. What time of year is it?

Winter Spring Summer Fall

SAY: The correct answer is SUMMER.

SAY: Now we will do some others just like that one.

SAY: 11) They wiggled their pink noses and sniffed lettuce. Their long ears were flat against their heads as they slipped into the garden. What animals were these?

lions tigers dogs rabbits

12) Mary was walking in the snow. She pulled her coat closer but the wind blew the icy snow against her face. What kind of day was it?

pleasant warm tiresome cold

13) Mary was two blocks away when the school bell rang. She ran fast but all the children had gone inside before she reached the door. What was Mary?

early late sleepy dead

14) The snow fell in great lazy flakes that soon covered the ground like a blanket. Tom got out his leggings and overshoes. It was very cold. It was now

spring winter summer fall

15) On the table was a roast turkey with cranberry sauce. There were also ears of yellow corn, pumpkin pies, and apple cider. For what was this table ready?

games sale wood dinner

16) James brought out a rake, a hoe, a spade, and a sprinkling can. What do you think James was going to do with these tools?

garden sing shoot fight

17) The sloth is an animal with hooks instead of feet. It can't really walk, but it can travel miles in the trees. What does the sloth like best?

plains fire mountains forests

18) A frozen river between two mountains is called a glacier. It does not melt even in summer. How must the air around it feel?

mild cold hot balmy

19) The blue roadster was in the ditch. The wrecking car got it out again with just one pull. What do you think the wrecking car had to be?

beautiful strong old light

20) It is fun to have a clambake. Go down to the shore at low tide. Take a bucket and a shovel. What do you dig in to find the clams?

sand plants woods buckets

TIMING: No time limit.

SCORING: Each item is scored 1 or 0.

MAXIMUM SCORE: 20.

TEST V-E
Integration - Symbolic
(Numbers)

Directions (I): Read the directions as stated. Subject may count with fingers if he wishes. Examiner may write down answers for items 11-15, if child needs help. Examiner may repeat the more difficult items once or more if needed.

SAY: 1) Count this row of dots. (Show line with 5 dots.)

2) How many dots do you see? (Show line with 10 dots.)

3) Now how many dots do you see? (Show line with 15 dots.)

4) Sue has six dolls. Cathy has five. Who has more dolls? (Sue.)

5) Jack bought 58 stamps. Alan bought 85 stamps. Who bought less stamps? (Jack.)

Now show child Test Form V, E. pictures in his booklet.

6) Look at the glasses. Tom uses the second glass for his milk. Put a mark on the second glass.

7) Look at the puppets. Sally made the fourth one. Put a mark on the fourth puppet.

8) Look at the pieces of cake. One piece of cake is cut in half. Put a mark on that piece.

9) Look at the six lollipops. We saved half of them for Diane. Put marks on the lollipops we saved for Diane.

10) Look at the bricks of ice cream. Put a mark on the brick which is cut in fourths.

SAY: Write the correct answer on the line after I ask you some questions:

11) Which is larger? 1/4 or 1/2? (1/2.)

12) Which is smaller? 1/2 or 1/3? (1/3)

13) Bob had $6.00. He spent 1/2 of his money for bike supplies. Bill spent 1/4 of his $8.00 on models. Who had more left? (Bill)

14) At a school candy sale, the boys each brought 1/2 lb. of fudge and the girls each brought 2/3 lb. of suckers. Who brought the most candy? (Girls.)

15) The Tigers have won 45% of all their games and the Twins have won 65% of theirs. Which team is ahead? (Twins.)

TIMING: No time limit.

DISCONTINUE: On items 11-15, discontinue after 3 consecutive failures.

SCORING: Each item is scored 1 or 0.

MAXIMUM SCORE: 15.

TEST VI-A
Fine Motor Control

Directions (G): The child is given a geometric form worksheet and is asked to identify each of the forms: "Tell me what you would call this," pointing to the circle, etc., down the page. If the child is unable to name, tell him as needed. He is told to reproduce each of the forms as accurately as he can three times in the spaces provided.

SAY: Copy each form. Do each one three times in the boxes. Do the best you can.

TIMING: No time limit.

SCORING: The geometric form worksheet is given five separate scores.

1) Circle and square are scored as a unit
2) Diamond
3) Composite form
4) Vertical lines
5) Horizontal lines

The items are scored for accuracy of reproduction with emphasis on motor control. Poor line quality, erasures, marking over, all contribute to lowered scores. More than half of the forms for each scoring item must meet the scoring criteria to be considered for the higher of two possible scores. Scoring examples are provided in Appendix E.

Each scoring unit is scored:

1) Inadequate
2) Transitional
3) Adequate

MAXIMUM SCORE: 15.

TEST VI-B
Eye-Hand Coordination

Materials: Scissors, small envelope.

Directions (G): The child is given geometric form worksheet and scissors. Left-handed scissors should be available. Subject is told:

SAY: Cut out the forms as carefully as you can. Cut on the line. Put the circles in the envelope when you have finished.

TIMING: No time limit.

SCORING: The child's ability to cut on a line is specifically scored. The items are scored on smoothness and accuracy. Give one score for large and small circles separately. See Appendix E for scoring examples.

1 = Inadequate

2 = Transitional

3 = Adequate

MAXIMUM SCORE: 4.

TEST VII
Gross Motor Coordination

Directions (I): The examiner should be sure the room for testing is adequately prepared in advance. Chairs, tables, or other objects, should be pushed to the side to make room.

SAY: Here are some things I want you to do.

JUMPING:

A) Both feet:

Stand the child at the side of the room where he has a clear space measuring the length of the room in front of him. Ask him to put both feet together and to jump forward one step. The child must hold his feet together while he jumps and he must not step forward as in walking.

B) Right foot:

Ask the child to stand on his right foot (show if needed) with his left foot off the floor. Now ask him to jump forward one step using his right foot only. During the task the left foot must not touch the floor.

C) Left foot:

Ask the child to stand on his left foot and jump one step forward on his left foot only.

D) Skip:

Ask the child to skip across the room using the feet alternately. Do not demonstrate.

E) HOP 1/1:

Ask the child to stand with his feet together. Now ask him to hop on the right foot, lifting the left. Next, ask him to hop on the left, lifting the right. Now ask him to alternate hopping first on the right, then on the left. The child's body must remain in one spot during the hopping performance.

JUMPING (continued):

F) HOP 2/2:

This task is the same as the foregoing, except the child hops twice on the right foot, twice on the left foot, etc.

G) HOP 2/1:

Ask the child to hop twice on the right foot; once on the left; twice on the right, etc.

H) HOP 1/2:

Ask the child to hop once on the right foot, twice on the left, etc.

TIMING: No time limit.

SCORING: These items are related to the child's ability to control his gross musculature and to alternate activities across the center of gravity of his body. There is also a factor of rhythm.

Each item is scored separately 1 or 0.

Score 1: if the child performs task easily, no loss of balance, or stepping down with other foot when hopping.

MAXIMUM SCORE: 8.

IDENTIFICATION OF BODY PARTS:

Place the child facing the examiner at a distance of about 10 feet. Instruct the child to use one or both hands, as needed.

SAY:

a) Touch your shoulders

b) Touch your hips

c) Touch your head

d) Touch your ankles

e) Touch your ears

f) Touch your feet

g) Touch your eyes

h) Touch your elbows

i) Touch your mouth

TIMING: No time limit.

SCORING: Each item is scored separately 1 or 0. Score 1 if child performs adequately throughout, without hesitancy or confusion. He should point to both of the paired parts without "feeling around." Some allowance may be made for "elbows" item.

MAXIMUM SCORE: 9.

TEST VIII
Linguistics - Input

Directions (G): Read the directions as stated. This is a test of decoding oral directions.

SAY: I want to find out how well you can follow directions. I will tell you what to do with some of the pictures in the boxes. One repetition can be offered with sample items only.

Samples:

A) Put an X on the ball.

B) Put an X on the milk bottle.

C) Draw a line under the little book.

D) Draw a line from the pig to the tree.

SAY: TURN PAGE:

1) Draw a line under the dog that is sleeping.

2) Draw a line under the dark cloud in the sky.

3) The father told the boy to put his pony in the barn. Draw a line from the pony to the barn.

4) These boys are at their school picnic. They are running a race. Draw a line around the one who is leading in the race now.

5) It is another rainy day. The children are going to school. They came in the school bus. They have umbrellas and rubber boots. Put an X on the place they are going.

6) A child was told to hang his coat on the hook between the windows. Look for the place where his coat should hang, and put an X on it.

7) This boy was very happy. He had saved a dollar to buy his mother a plant for her birthday. He found a store where they sold plants. Find the thing the boy had saved and mark it with an X.

8) This little spider is spinning a web in the corner of the ceiling. The web is very fine and soft. Draw a line from the spider to the little window.

SAY: TURN PAGE:

9) At the Halloween party we had so much fun. We danced, played games, sang songs, and bobbed for apples in a tub. Draw a line from a child to a tub.

10) Yesterday the circus came to town. We saw animals and big wagons, and the clowns made us laugh. Make an X on the clown with black spots on his suit.

11) Two girls were caught in the rain. As there was no shelter, their teacher shared her umbrella with them. Draw a line from the smallest girl to what the teacher shared.

12) A cow produces milk, from which we get cream and make butter and cheese. From a steer we get beef. Calves' liver is a very important food for persons suffering from a certain vitamin deficiency. Put an X on the animal that gives us milk and cream.

13) The New York State Thruway is a super highway. It crosses New York State. Another super highway is the Pennsylvania Turnpike, which crosses Pennsylvania. Draw a line around the name of the highway that you would take to go from Albany to Buffalo.

14) Writing tools have changed since the United States came into being. John Hancock signed the Declaration of Independence with a pen made from a feather. Today people write with pencils, pens, or typewriters. Put an X on the kind of pen John Hancock used.

15) Here are three shapes: a circle, a triangle, and a square. The circle has no corners at all. The triangle has three corners, and the square has four corners. Draw a line from the shape that has three corners to the other shape that has corners.

TIMING: No time limit.

SCORING: Score each item 1 or 0. Directions for marking must be followed exactly.

MAXIMUM SCORE: 15.

TEST IX-D

Tactile Perception

Materials: Blindfold.

Directions (I): Have the child sit in a chair facing the examiner with both hands resting palm downward on thighs. Child's vision is occluded.

SAY: I am going to touch you with my fingers in two places at the same time. I want you to show me where I touched you.

Examiner touches the child, using two index fingers, with simultaneous motion, in the following sequence:

1) Right cheek - left hand

2) Left cheek - right hand

3) Right cheek - right hand

4) Left cheek - left hand

5) Right cheek - left cheek

6) Right hand - left hand

7) Right cheek - left hand

8) Left cheek - right hand

9) Right cheek - right hand

10) Left cheek - left hand

11) Right cheek - left cheek

12) Right hand - left hand

13) Right cheek - left hand

14) Left cheek - right hand

If, after the second trial, the child points to only one place, he is asked if he had been touched in any other place.

TIMING: No time limit.

SCORING: Each item is scored 1 or 0.

MAXIMUM SCORE: 14.

TEST IX-E

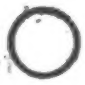
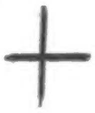
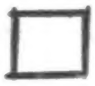
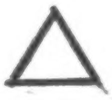
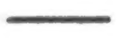
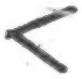
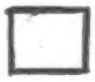
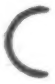
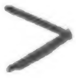
Tactile Perception

Materials: Blindfold.

Administration (I): Child is placed facing the examiner and is blindfolded. Examiner draws each figure on the palm of the child's dominant hand (hand you write with).

SAY: I am going to draw some figures on your hand. I want you to draw the same figure on my hand with your finger.

Figures:

1) Circle 
2) Plus sign 
3) Box 
4) Triangle 
5) Short straight line 
6) Angle point subject's left 
7) Box 
8) Half moon (opening to subject's left) 
9) Angle point subject's right 

TIMING: No time limit.

SCORING: Each response is scored 1 or 0. Responses to items 6, 8, and 9 may be in either direction, as recognition of form is being measured.

MAXIMUM SCORE: 9.

TEST IX-F

Kinesthetic Perception

Materials: Blindfold; map; centimeter ruler.

Directions (I): Read the directions as stated. Place map in front of subject. Introduce test as stated and then blindfold subject.

SAY: We're going to play a game called "Going to Mary's House." This is a game for your hands to play without your eyes looking. (Occlude vision.) This is where you live. (Examiner holds subject's index finger of dominant hand by the distal joint and puts finger at start of line 1.) I'm going to take you to Mary's house. (Examiner lifts subject's finger and carries it to the end of line 1.) This is where Mary lives. Remember where she lives so you can come back here all by yourself. (Allow three seconds of silence for subject to feel where he is.) I'll take you home. (Examiner lifts subject's finger and returns it to "home.") There's home. Now you go to Mary's house all by yourself.

After the subject has put his finger on Mary's house, have him look and see how close he was. Use the first test item to make sure the subject understands the nature of the task. Thereafter, do not let him see how close he comes until the test is over. Avoid cutaneous, auditory, and facial clues which might guide him to "home." Use middle of tip of subject's finger as point to place on "house."

On second time, use index finger from non-dominant hand.

SAY: I'll take you to a different house each time. This time we are going to John's house.

Procedure is repeated for this and subsequent items, using a different house for each item to help avoid perseveration, alternating hands.

TIMING: No time limit.

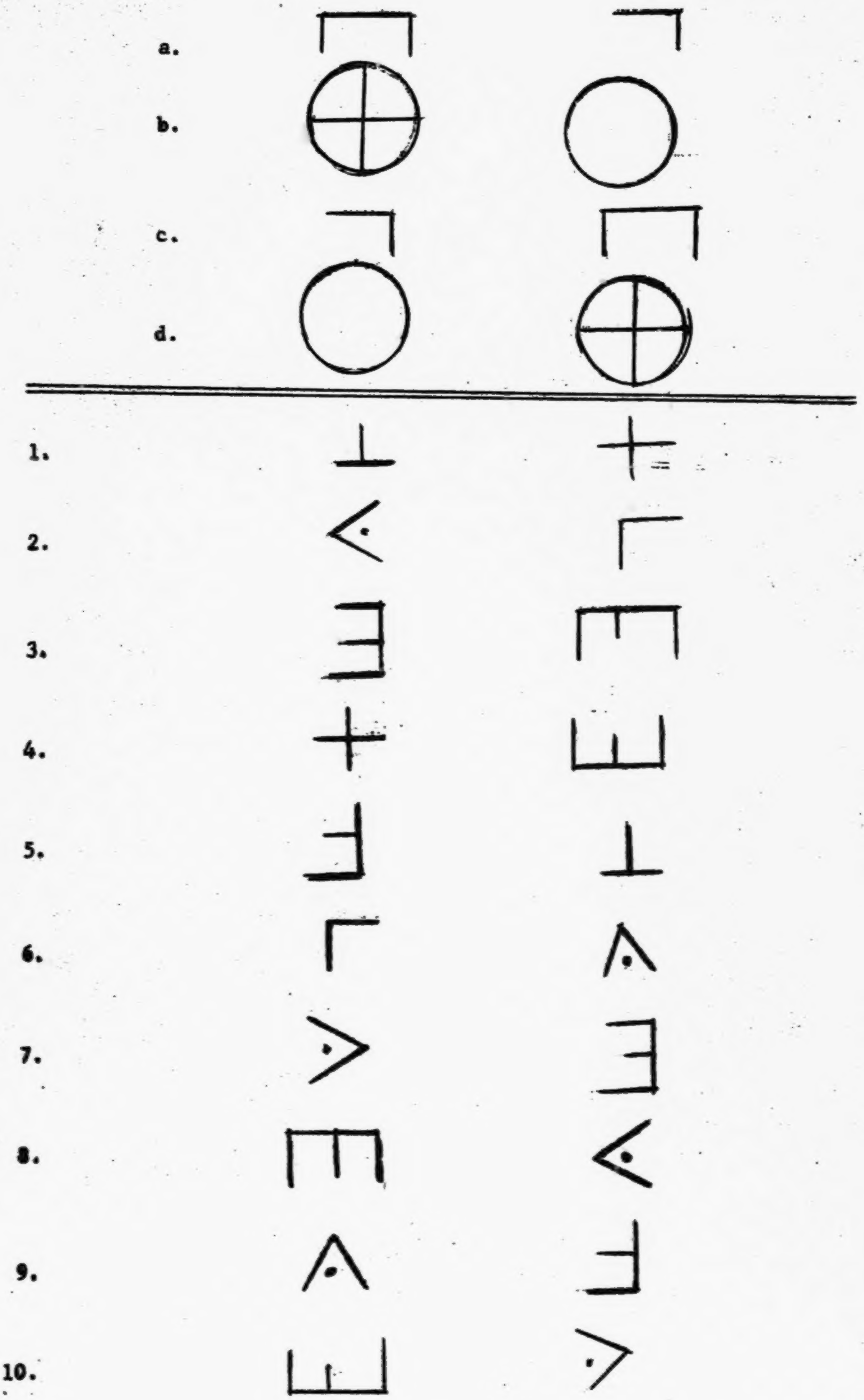
SCORING: Measure and record in centimeters the distance between goal and the middle of the tip of subject's finger, i.e., how far "off" the subject was from each house.

MAXIMUM SCORE: Three scores are calculated:

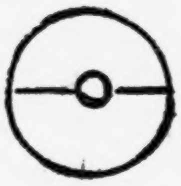
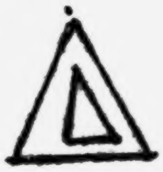
Left - Total score
Right - Total score

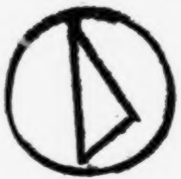
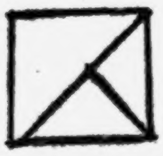
TOTAL SCORE

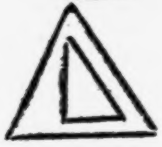
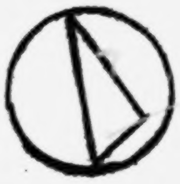
TEST I-A

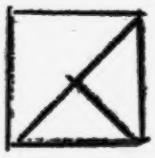
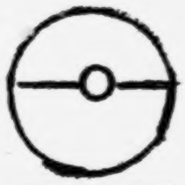

a.
b.
c.
d.
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

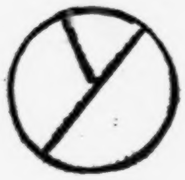
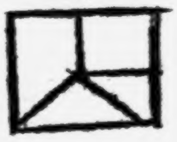
TEST I-A (continued)

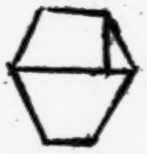
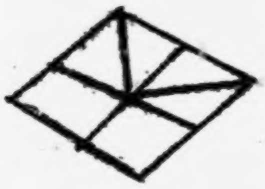
11.  

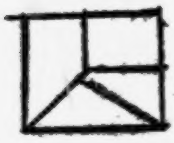
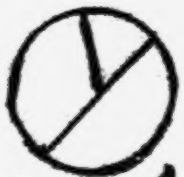
12.  

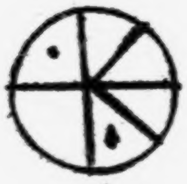
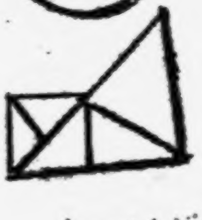
13.  

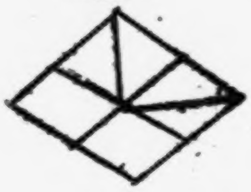
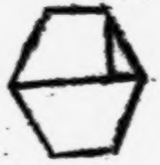
14.  

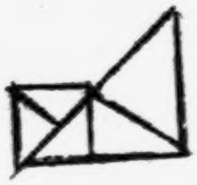
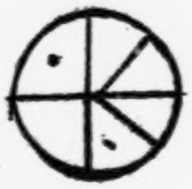
15.  

16.  

17.  

18.  

19.  

20.  

RAW SCORE__________________

TEST I-B

E.	O	M	O	R	S
1.	H	W	A	H	S
2.	F	P	F	E	D
3.	b	b	d	p	q
4.	at	to	of	it	at
5.	buy	any	cat	buy	for
6.	hit	get	sat	its	hit
7.	make	take	brake	make	mate
8.	clock	block	flock	click	clock
9.	protect	protest	promote	pretext	protect
10.	neither	neighbor	feather	neither	heather
11.	delight	daylight	delightful	detest	delight
12.	surprise	suppose	surprise	surpass	surplus
13.	property	prosperity	prophecy	probably	property
14.	vertical	versatile	virtual	vertical	verbal
15.	circular	circulate	cinerator	circular	circuit

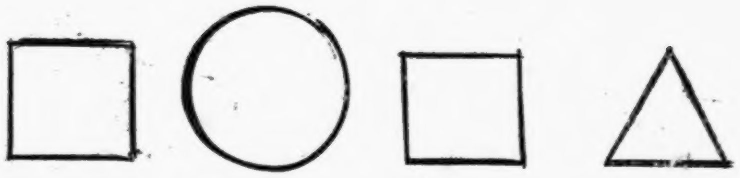
TEST I-B (continued)

16.	principal	principle	printable	primeval	principal
17.	modality	modesty	mollify	modality	modify
18.	coagulate	coaction	coordinate	coagulate	cooperate
19.	operation	opposition	operation	operator	opinion
20.	variation	vaccination	valuation	variation	vaporization
21.	continental	centennial	comptroller	contemplation	continental
22.	thermostat	thermoplastic	thermometer	thesaurus	thermostat
23.	liturgical	literal	liturgical	lethal	liberal
24.	perpendicular	perpetration	perpendicular	particular	perpetual
25.	heterogeneous	homogeneous	homologous	heterogeneous	histrionic

RAW SCORE______________

TEST I-D

A.



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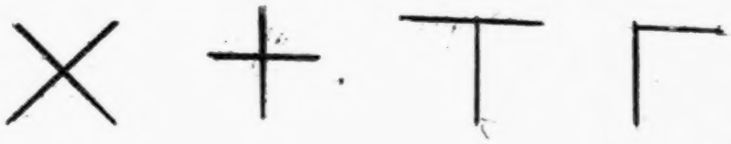

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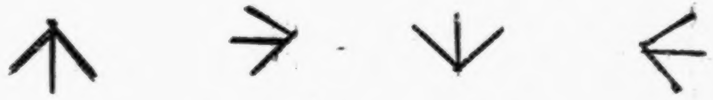

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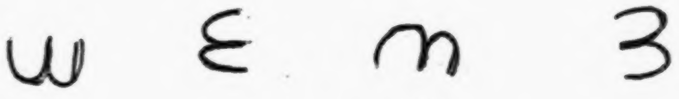

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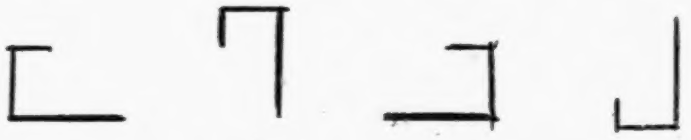

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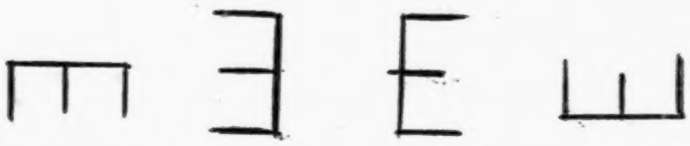

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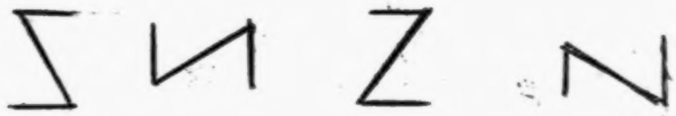

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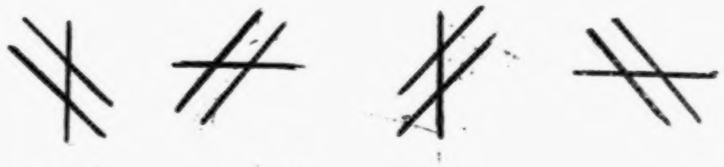

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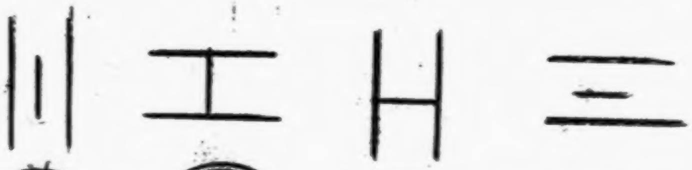

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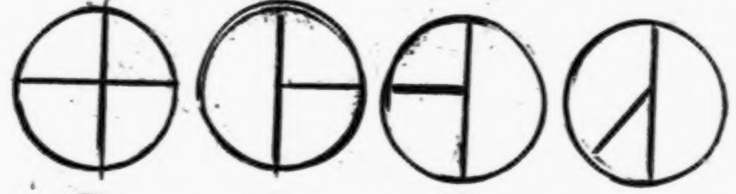

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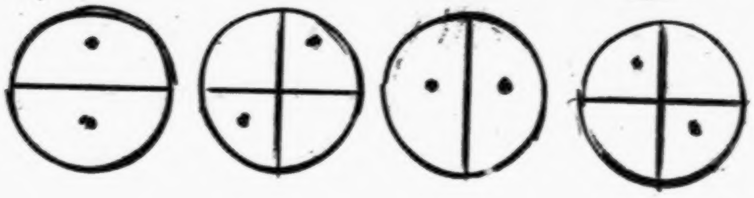

RAW SCORE__________

EST I-E

.   y   b   d   g   f

2.   m   h   n   r   t

3.   no   on   imp   in   nip

4.   saw   war   as   was   waste

5.   girl   dog   boy   dig   day

6.   won   no   now   mow   was

7.   lack   clock   black   block   dark

8.   frost   first   fast   firm   trust

9.   slat   last   lost   lot   blast

0.   jump   jest   just   jot   must

1.   clear   clean   close   climb   lean

2.   par   park   trap   party   quart   dark   part

3.   quiet   quick   quack   point   quite   question   quit

4.   state   elation   tasted   station   stationed   started   skating

5.   nomination   notion   mention   mountain   mountains   motion   mentioned

6.   quarter   portion   bracelet   particle   practice   practical   poultice

7.   obscure   advice   above   advise   advances   dance   advance

8.   sure   obscure   scare   secure   second   server   cure

9.   contact   contain   contract   contracts   contacts   capital   convince

0.   immediate   meditates   mediate   mistake   meditate   material   meditative

RAW SCORE________________________

TEST I-F

1. ____________________
2. ____________________
3. ____________________
4. ____________________
5. ____________________
6. ____________________
7. ____________________
8. ____________________
9. ____________________
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28. ____________________
29. ____________________
30. ____________________
31. ____________________
32. ____________________
33. ____________________
34. ____________________
35. ____________________

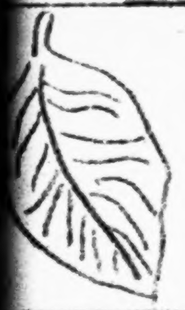
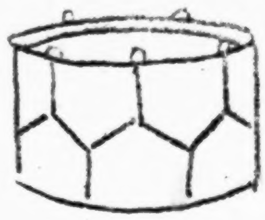
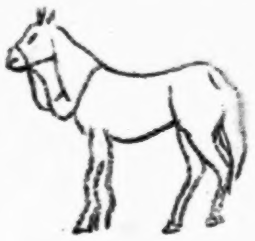
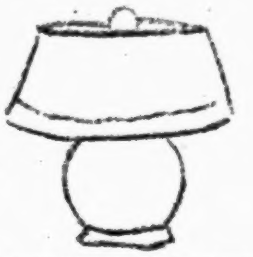
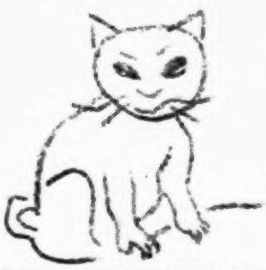
RAW SCORE____________________

TEST II-A

ITEMS	COR.	ERR.	NO RSP.
1. tin - thin			
2. late - date			
3. pig - big			
4. (gun - gun)			
5. test - text			
6. bud - bug			
7. chip - ship			
8. habitat - habitant			
9. sop - shop			
10. conical - comical			
11. (hoe - hoe)			
12. beats - beads			
13. cytology - psychology			
14. class - clasp			
15. mush - much			
16. patriarch - matriarch			
17. (peach - peach)			
18. wear - where			
19. biscuit - brisket			
20. foal - stole			
21. pass - path			
22. convergent - conversant			
23. falls - false			
24. (at - at)			
25. refracted - retracted			
26. coke - cope			
27. carrion - Marion			
28. (far - far)			
29. frisking - whisking			
30. thigh - sigh			
TOTALS			

RAW SCORE________________

TEST II, B.

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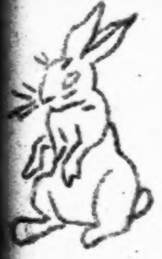
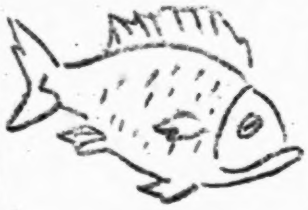
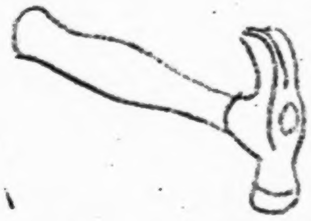
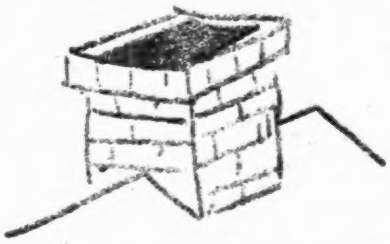
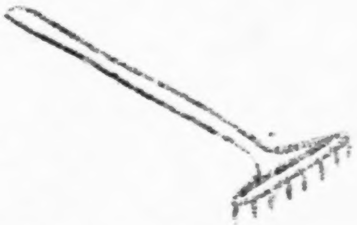

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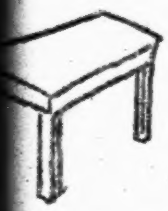
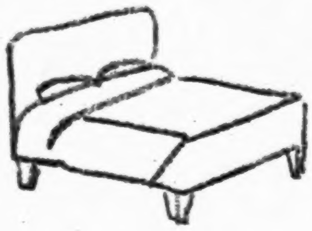
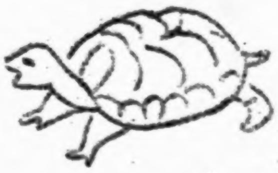
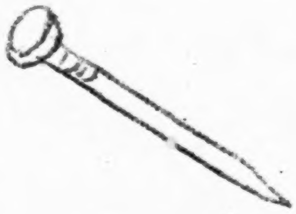
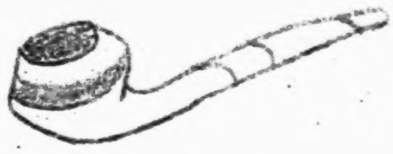

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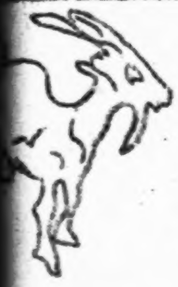
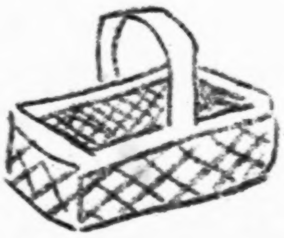
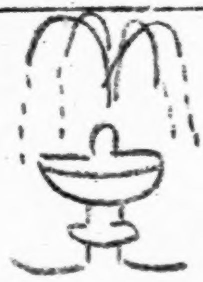
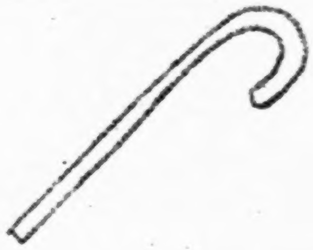
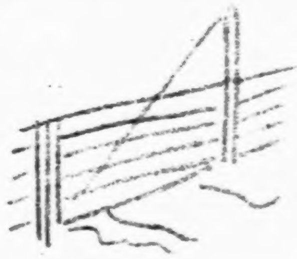

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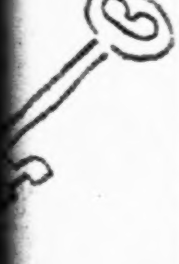
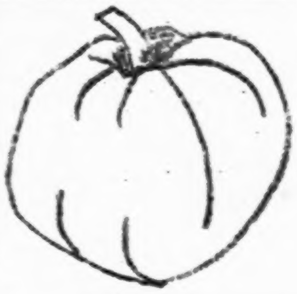
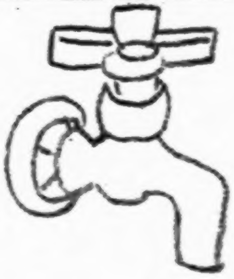
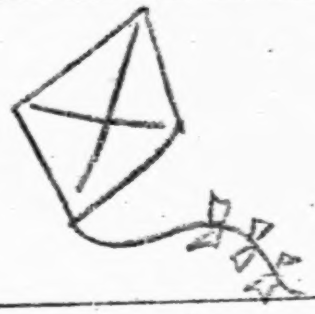
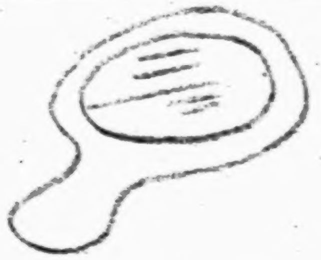
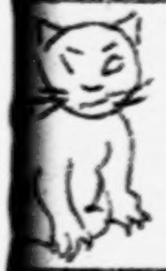
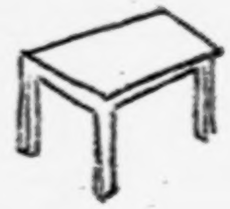
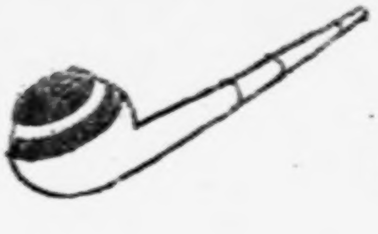
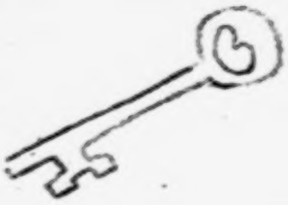
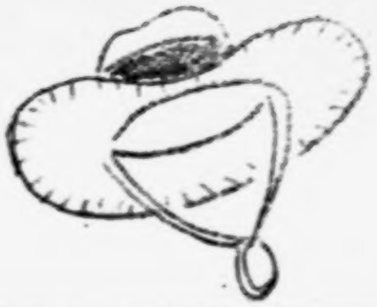






4.

RAW SCORE___________

TEST II. B.

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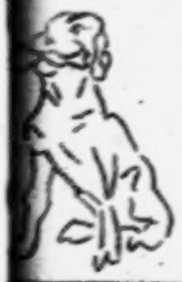
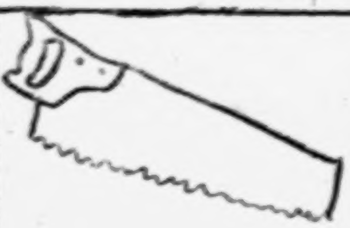
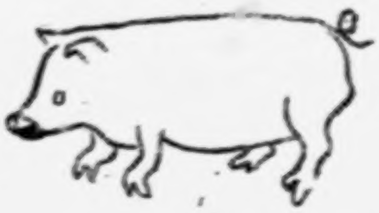
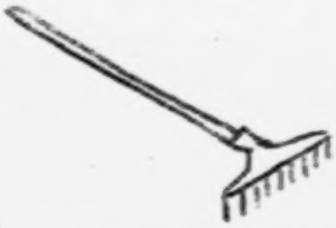
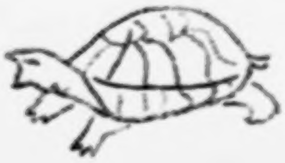

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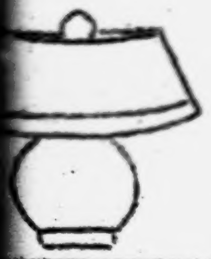
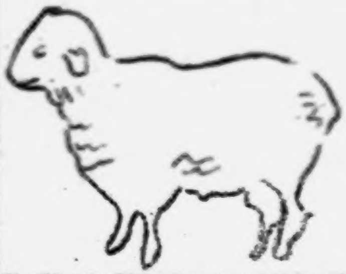
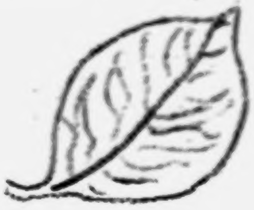
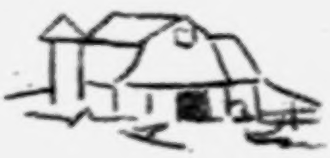
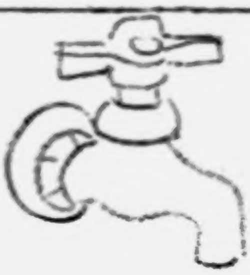

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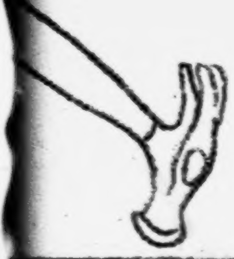
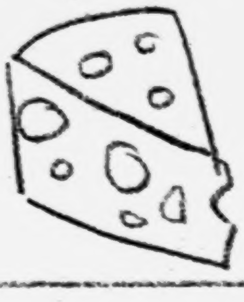
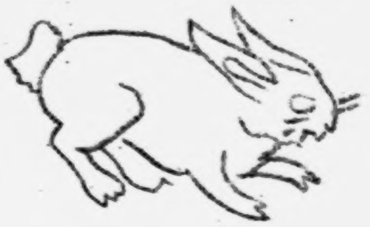
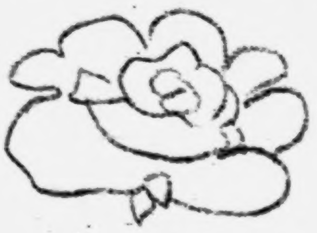
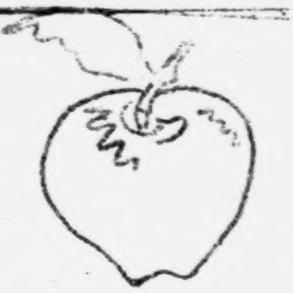

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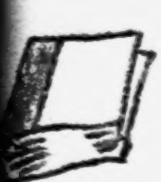
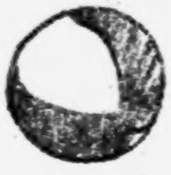
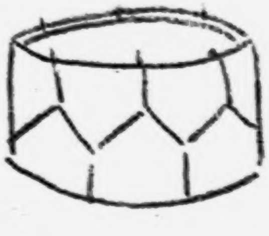
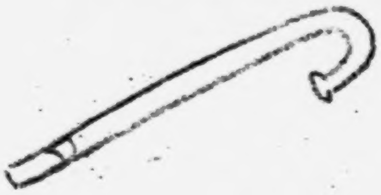
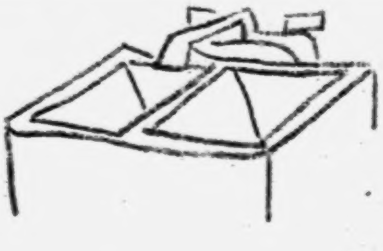
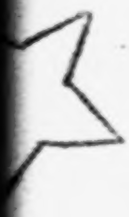
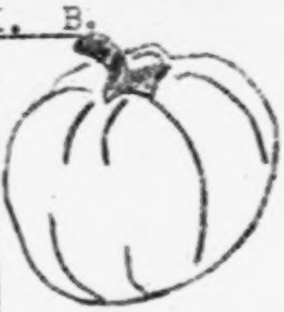
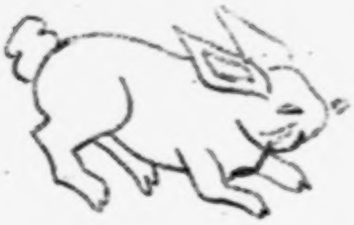
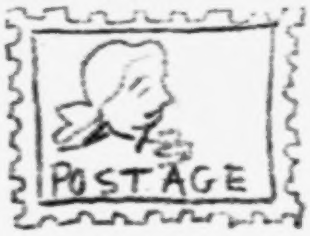
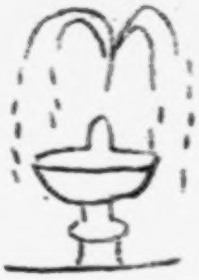






8.

RAW SCORE ____________

TEST II. B.



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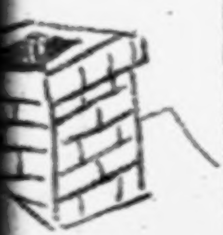
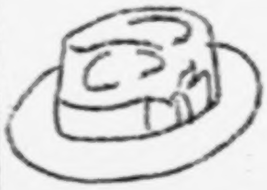
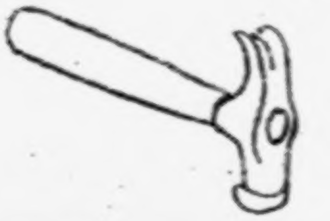
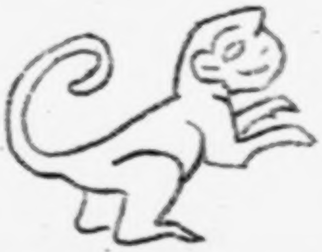
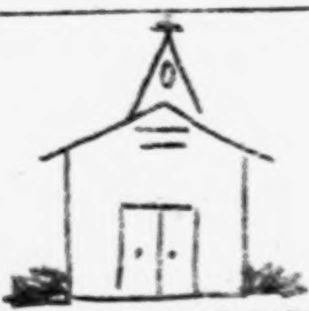

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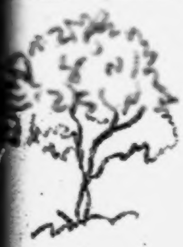
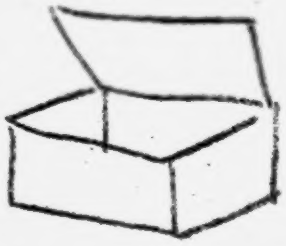
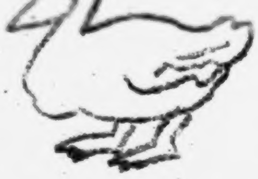
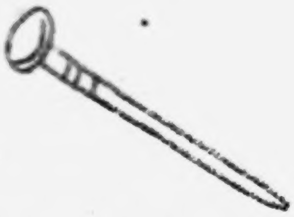
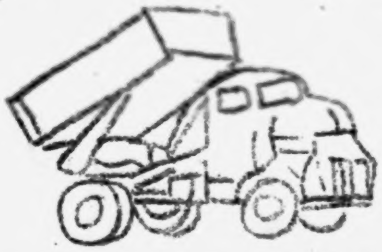

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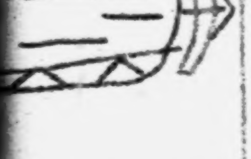
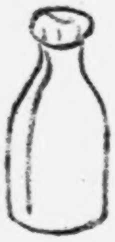
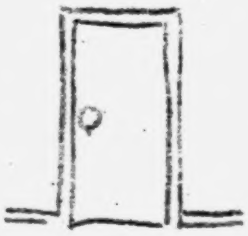
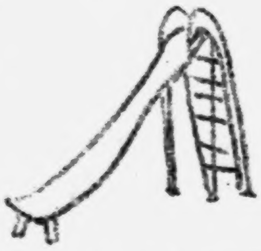
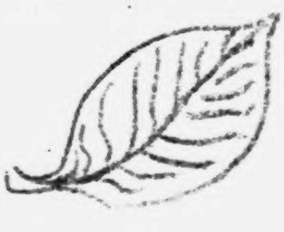

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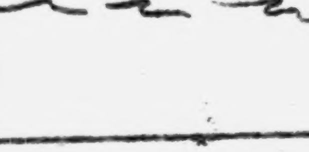
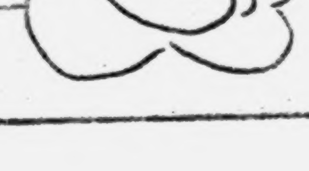
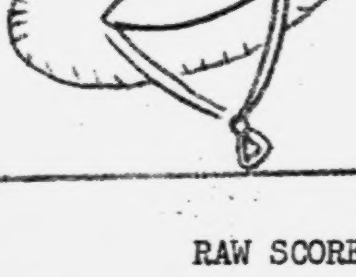
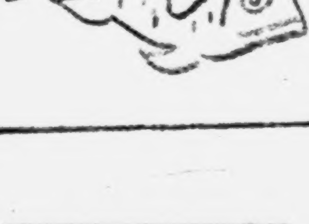

12.

RAW SCORE ______________

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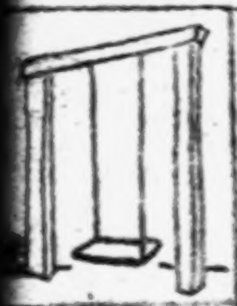
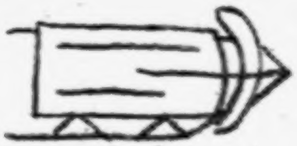
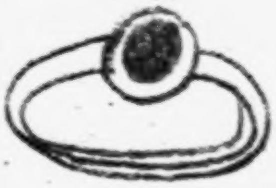
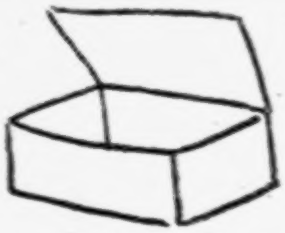
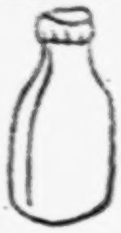

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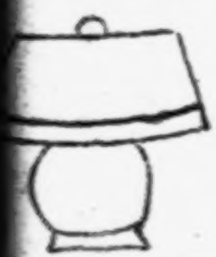
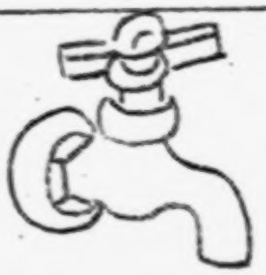
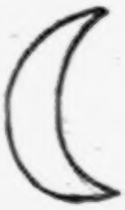
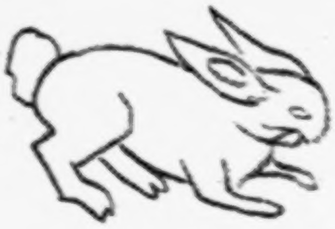
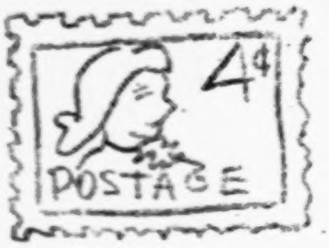

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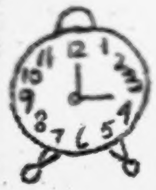
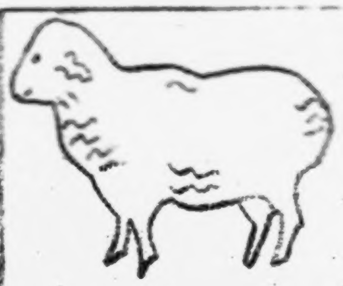
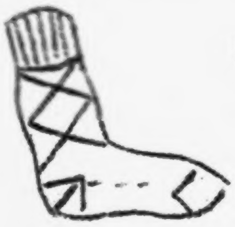
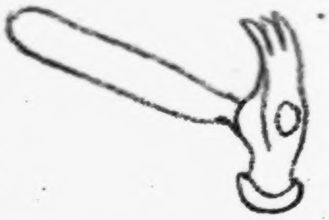
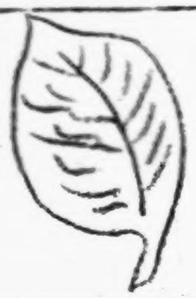

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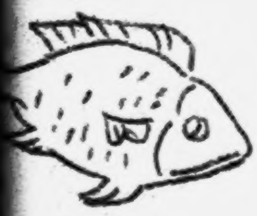
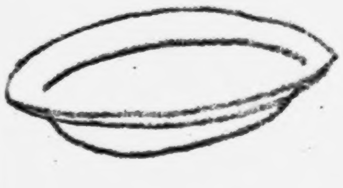
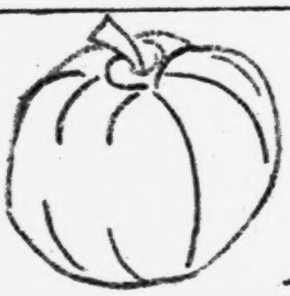
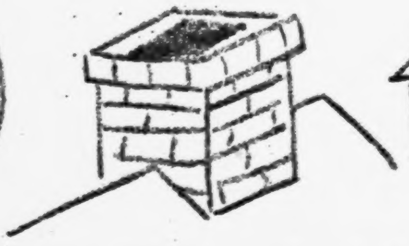
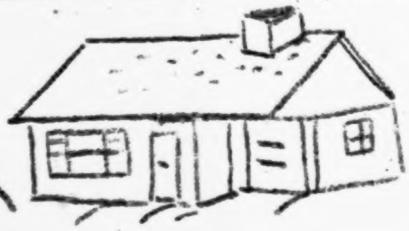

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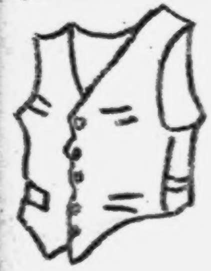
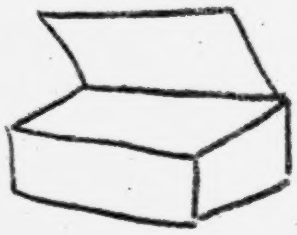
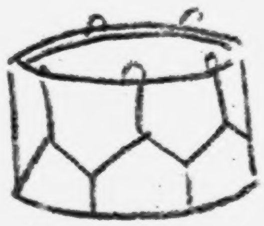
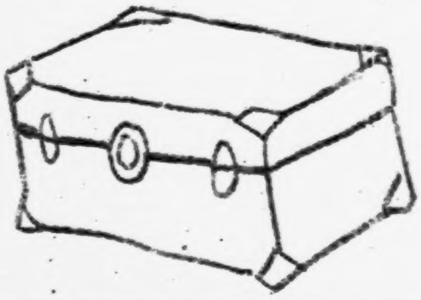
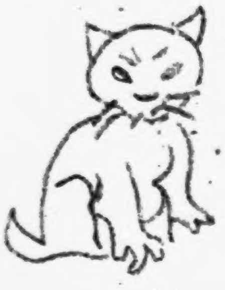
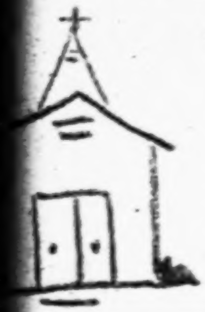
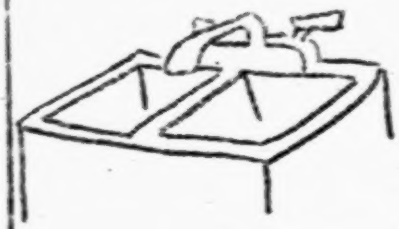
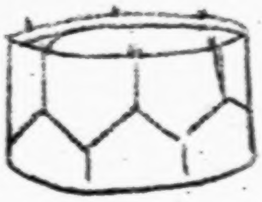
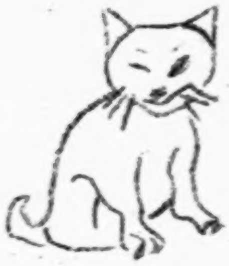
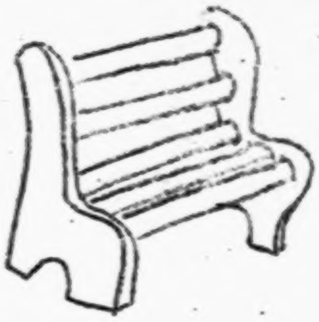






16.

RAW SCORE______________

TEST II, B.

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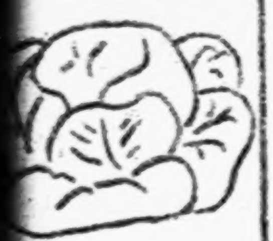
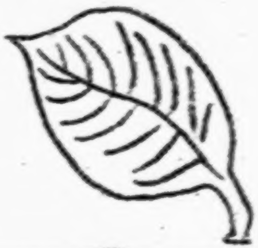
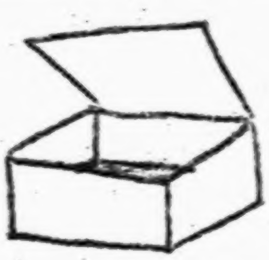
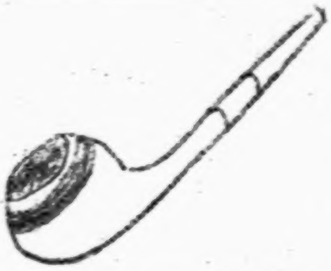
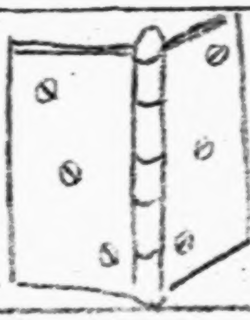

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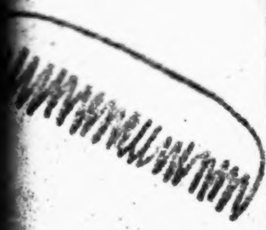
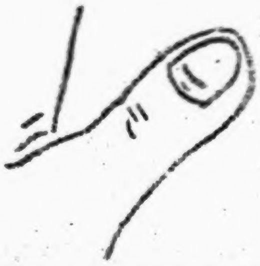
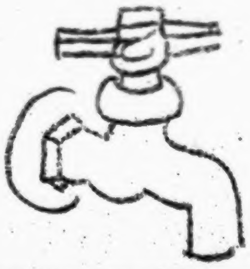
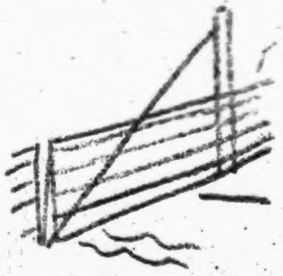
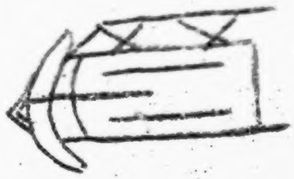

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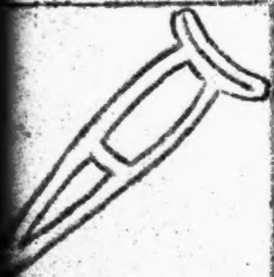
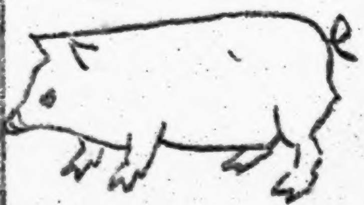
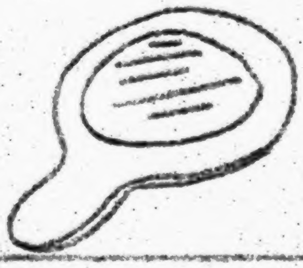
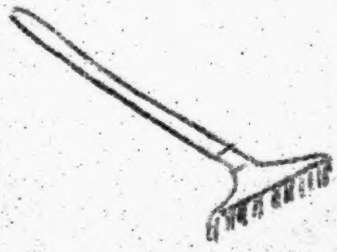
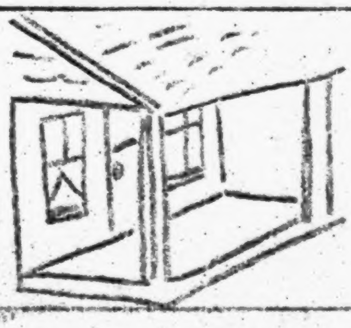

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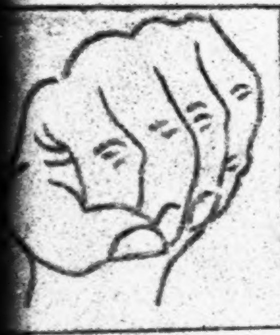
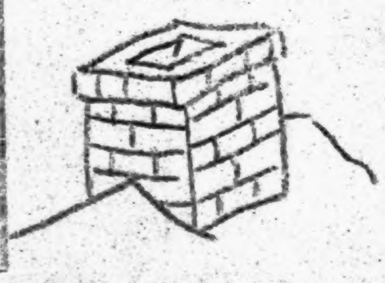
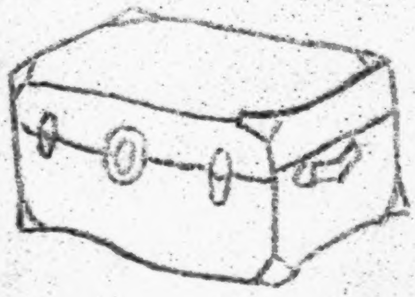
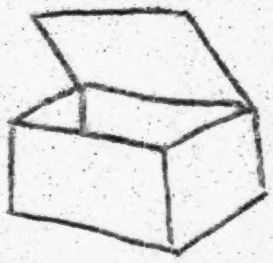
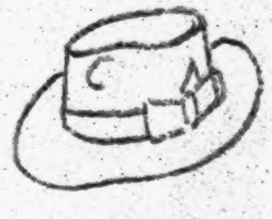
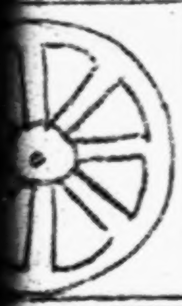
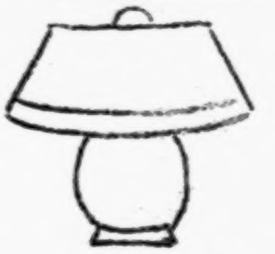
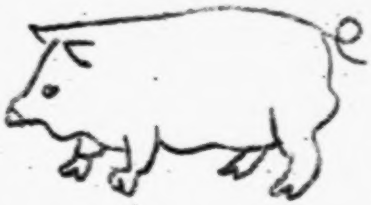
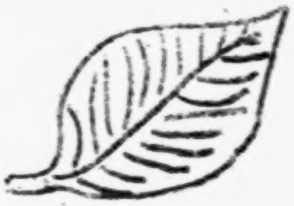
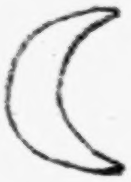






RAW SCORE__________________

20.

TEST II. B.

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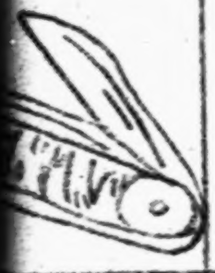
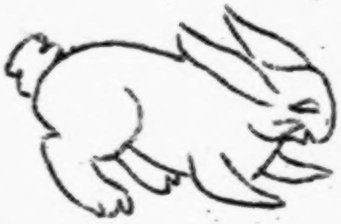
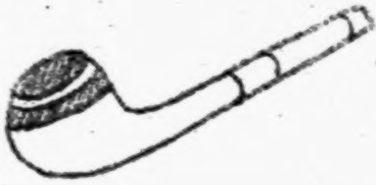
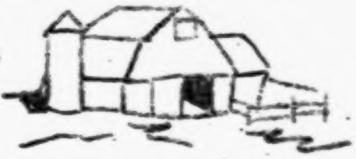
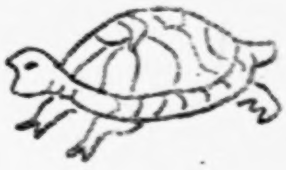

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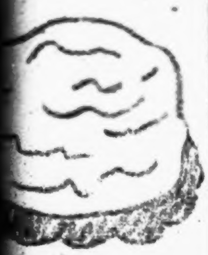
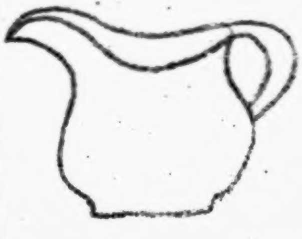
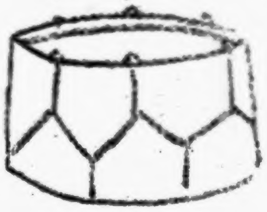
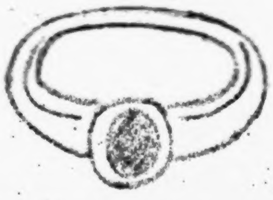
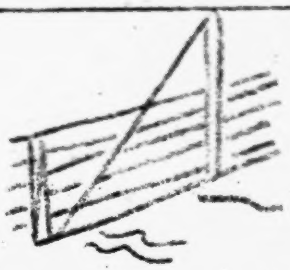

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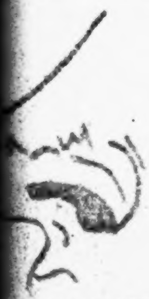
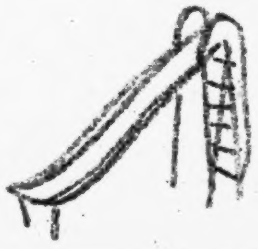
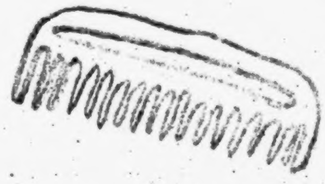
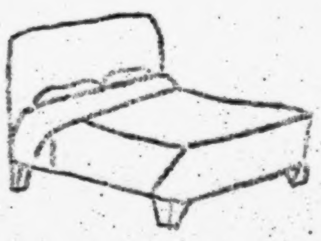
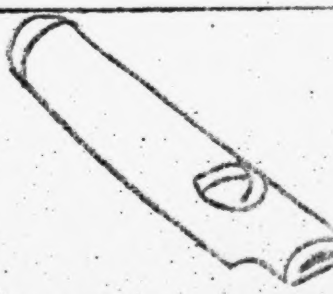

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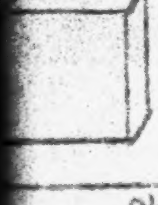
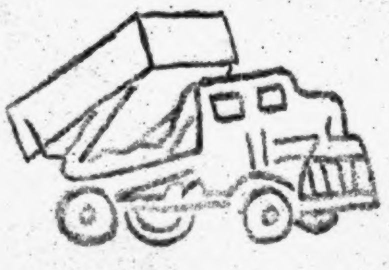
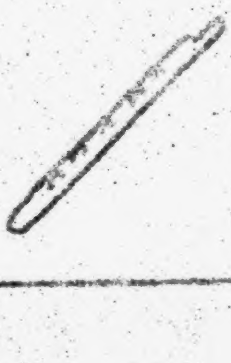
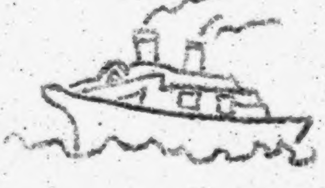
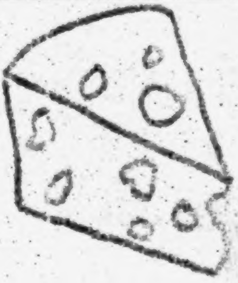

24.

RAW SCORE ____________

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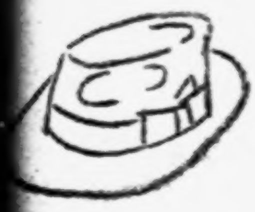
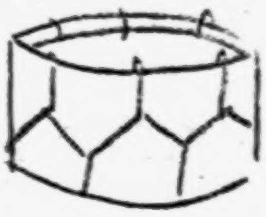
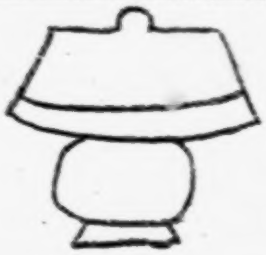
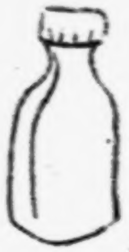
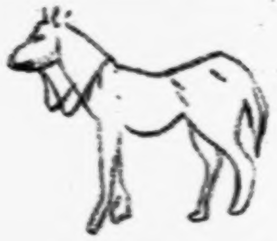

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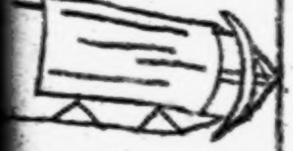
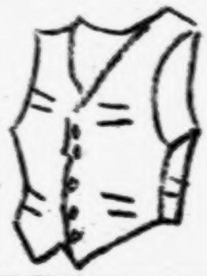
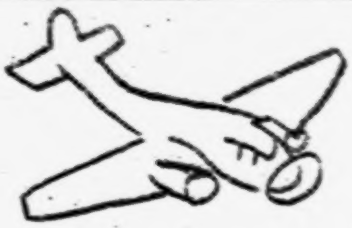
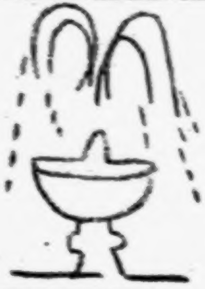
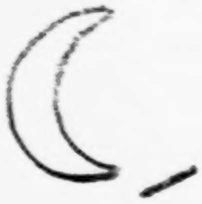

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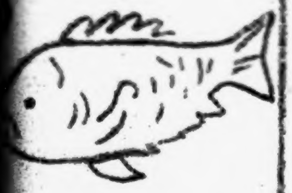
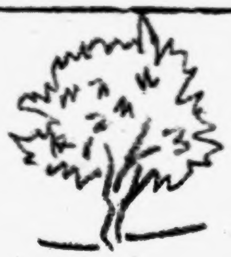
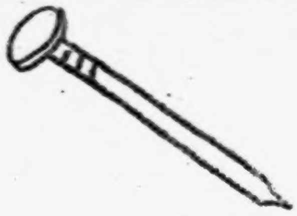
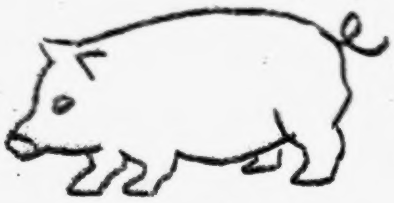
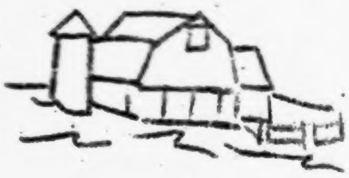

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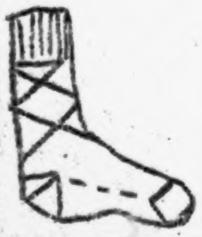
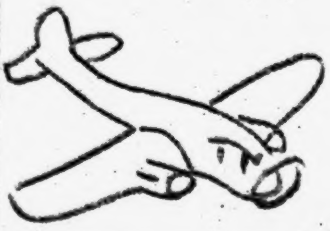
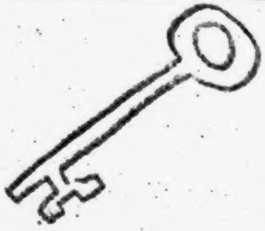
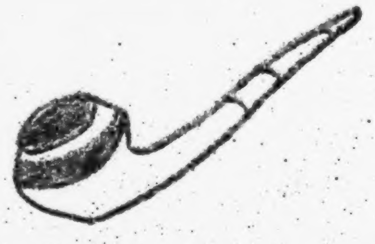
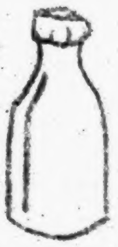

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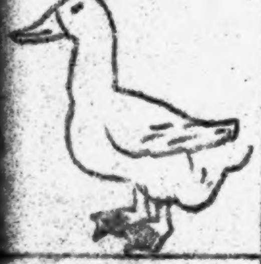
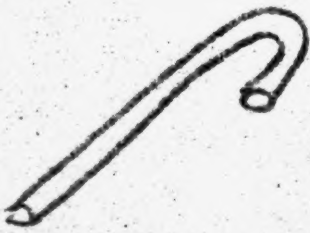
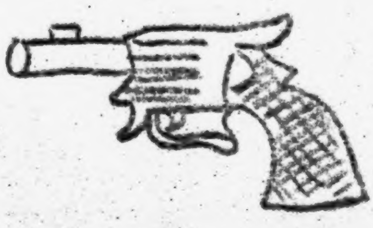
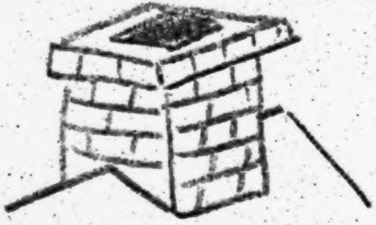
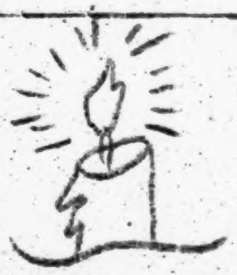

28.

RAW SCORE__________________

TEST III-A

1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

RAW SCORE__________________________

TEST III-B

GRADE I - II

A mother hen -- had three -- baby chicks. --
Their names were Scratchy -- Patchy -- and
Chick-Chick. -- One day -- the chickens --
went for a walk -- in Farmer Joe's garden. --
They were having a fine time -- eating lettuce --
when a big dog -- ran toward them -- barking loudly.
-- The chickens ran home -- as fast as they could, --
all except little Chick-Chick -- who hid -- behind a
big leaf -- until the dog went away. --

Maximum: 21

RAW SCORE ____________________

TEST III-B

GRADE III - IV

The children -- in Mrs. Smith's room --
talked -- about how to make scrapbooks. --
Jane brought -- some pictures. --
Billy brought -- some scissors -- and paste.
-- Martha brought -- some paper. --
The children decided -- that they would need
more paste than they had.--To make paste --
they would need water, -- flour, -- and salt.
-- Jane said she could bring -- a pan in which
-- to mix them. --

Maximum: 20

RAW SCORE__________________

TEST III-B

GRADE V - VI READING LEVEL

A very large area -- located in the Arctic Region -- of North America -- is called Alaska. -- Alaska is more than twice as large as -- the state of Texas. --

Alaska has a great variety of climate -- and surface features. -- Its ocean coastline is longer -- than that of the entire coastline of Continental United States. -- The curving coast includes -- many inlets -- straits -- and bays. -- The shores of Alaska are washed -- by the Pacific -- and Arctic Oceans. -- Except for about two months -- in midsummer, -- the Arctic Ocean is closed by ice. -- The interior has marked changes -- in temperature. --

Much of central Alaska -- is a plateau -- surrounded by mountains. -- In the high mountains -- are snow fields -- and glaciers. -- Many of these areas have seldom been visited by man. --

Alaska is rich -- in minerals, -- such as gold -- silver -- and copper. -- Salmon fishing, -- canning, -- and fur farming -- are profitable industries. --

Maximum: 38

RAW SCORE____________________

TEST III-C

GRADE 1 READING LEVEL:

The Cat and the Dog

_______1. What did the boy have?

_______2. What was he going to give her?

_______3. What happened when he called to her?

_______4. Where was the cat?

_______5. What was she doing?

_______6. What did the boy do then?

_______7. What happened next?

GRADE 2 READING LEVEL:

Dick's Birthday Present

_______1. What did Dick do when he woke up?

_______2. What day was it?

_______3. What did he find on his chair?

_______4. What did Dick hear?

_______5. What did Dick do then?

_______6. What was in the basket?

_______7. What did the dog do?

(continued on next page)

GRADE 3 READING LEVEL:

The Accident

_______1. What was this story about?

_______2. What had the boy been doing?

_______3. What was he riding?

_______4. What came down the road?

_______5. Why didn't he see the car coming?

_______6. How fast was the car going?

_______7. What happened to the boy?

_______8. What happened to the bicycle?

GRADE 4 READING LEVEL;

Peter Cooper's Engine

_______1. What did Peter Cooper build?

_______2. What was it used for?

_______3. How far away was the town?

_______4. What was the engine hooked to?

_______5. How fast did it go?

_______6. How long did the trip take?

_______7. What surprised the people?

(continued on next page)

GRADE 5 READING LEVEL:

Use of Kites

_______1. What was this story about?

_______2. What have kites been used for in war?

_______3. What did one General use kites for?

_______4. What was he going to build?

_______5. What do some people in China make?

_______6. What are these kites supposed to do?

_______7. What has the weather bureau used kites for?

_______8. How high has a string of kites gone?

_______9. How much can some kites lift?

GRADE 6 READING LEVEL:

History of Baseball

_______1. What is called the national sport?

_______2. What were some of its early names?

_______3. When was it first played in colleges?

_______4. What is said about its equipment?

_______5. What was responsible for its growth?

_______6. What happened to baseball after the Civil War?

_______7. What happened in the countries where the soldiers were stationed?

_______8. Who is said to welcome the baseball season?

(continued on next page)

GRADE 7 READING LEVEL:

General St. Clair's Defeat

_______1. What accounted for defeat in the first war waged by the United States?

_______2. How many men did General St. Clair have?

_______3. What were they going to do?

_______4. What did they neglect to do?

_______5. Where did the Indians attack?

_______6. What did General St. Clair do then?

_______7. How many men escaped uninjured?

_______8. How did President Washington feel about it?

TEST III,E

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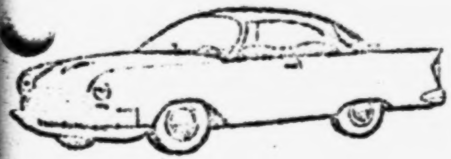

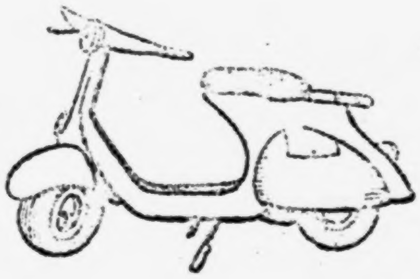

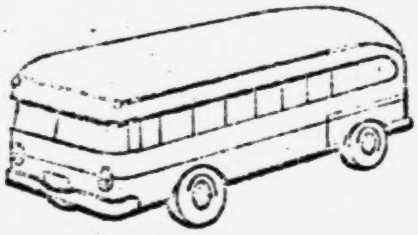

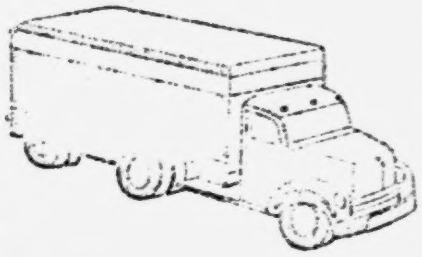

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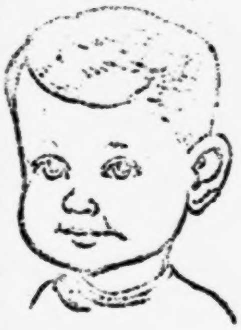

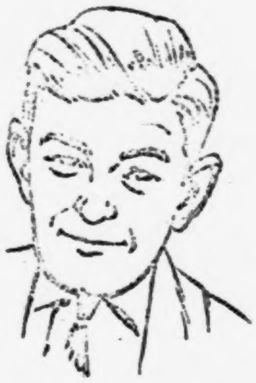

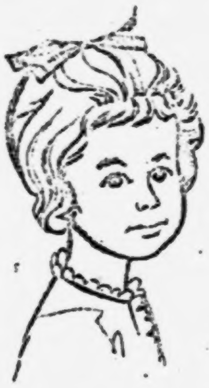

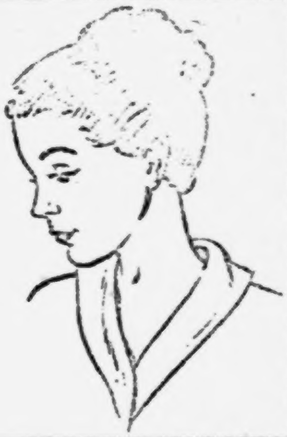

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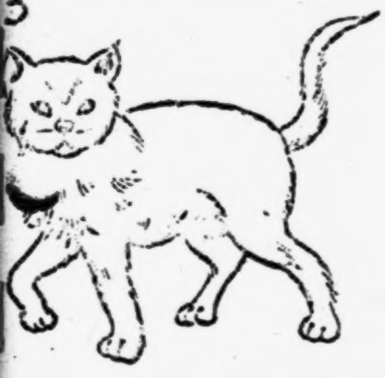

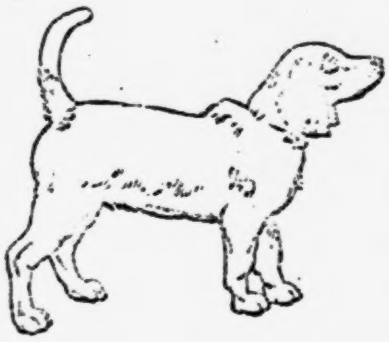

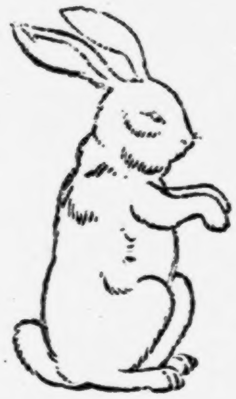

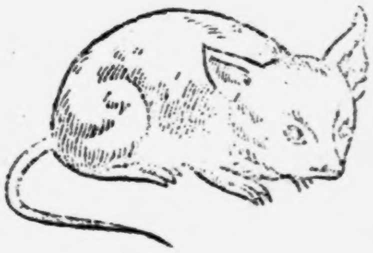

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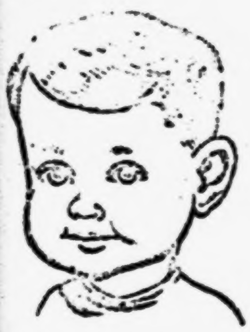

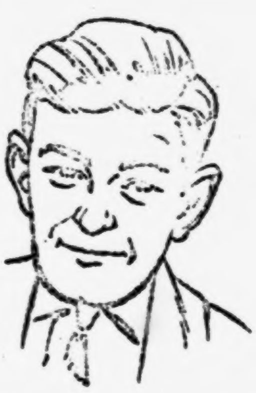

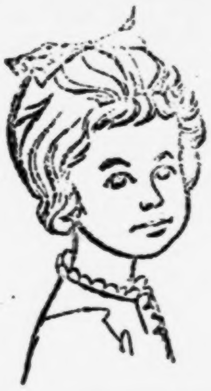

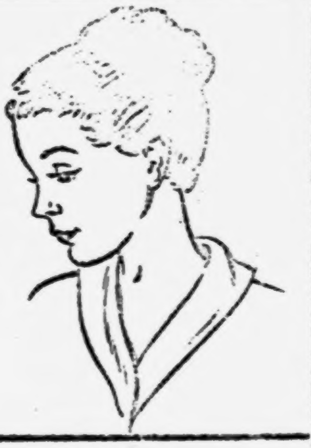

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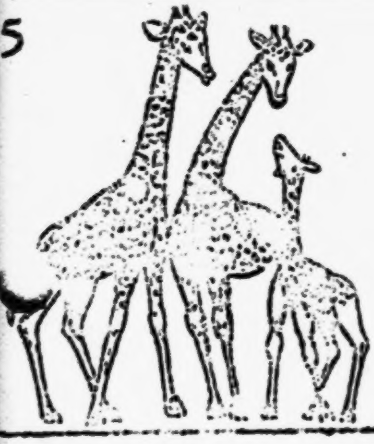

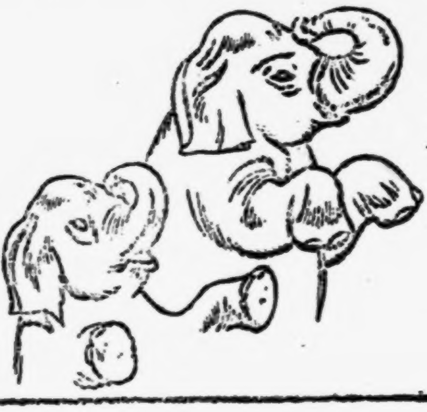

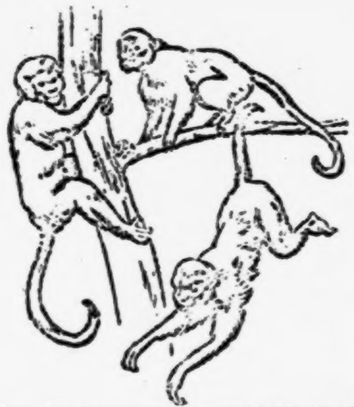

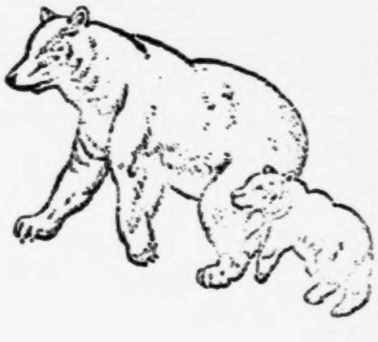

III-E
TEST [illegible]D. (Continued)

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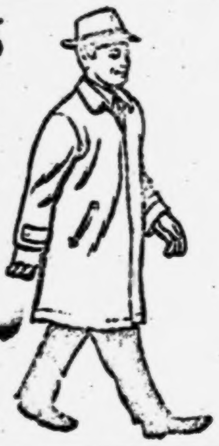

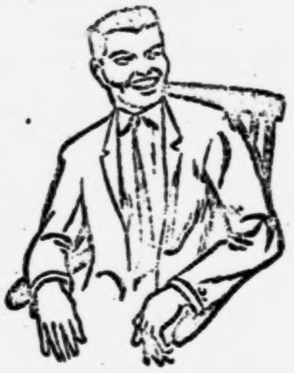

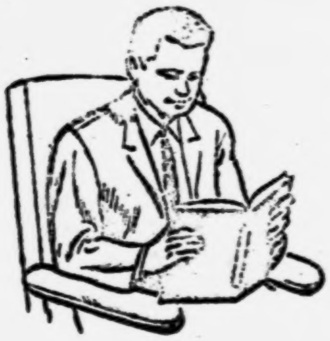

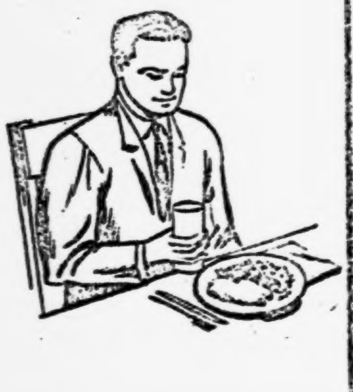

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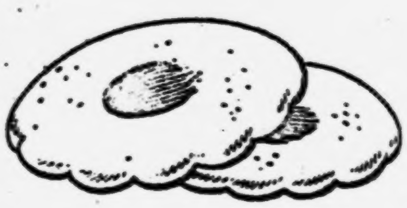
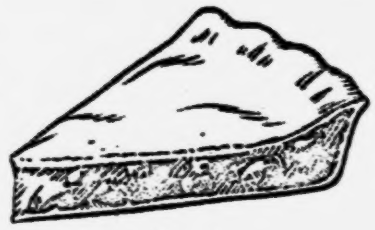
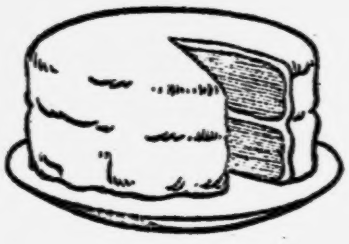
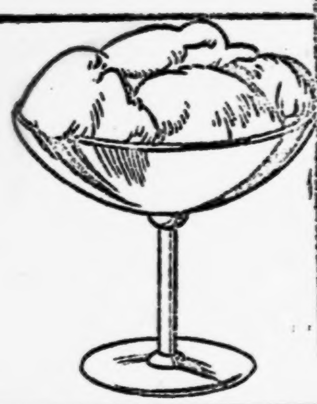








RAW SCORE ________________

TEST IV-A
(Rev. 5-67)

1. How old are you now?________________

2. When is your birthday?______________________

3. Have you ever seen me before?___________________

4. Have you ever seen me before you came to this place?_______________

5. How old am I?_________________

6. What day is it today?____________________

7. What day was it yesterday?______________________

8. What day will it be tomorrow?_______________________

9. What is the name of this place?_________________________________

10. What kind of place is it?______________________________________

11. What time do you eat breakfast?___________________

Lunch?____________________ Dinner?__________________

12. What part of the day is it? (Morning, afternoon or evening?)

____

13. What time is it?___________________________

14. Where are you now?____

15. Is there another (Name of the place of testing)?___________________

16. How long have you been going to school here?_______________________

17. Have you been in another (Name of other school)?___________________

18. Where do you live? (Address)____________________________________

19. How long does it usually take for you to get home from school?

____

20. Where is your school? (Address)_____________________________________

21. How far from school do you live?___________________________________

22. How long does it take for you to get to school from home?_____________

____

(continued on next page)

TEST IV-A (continued)

23. Name the days of the week______________________________

____

24. What day comes just before Friday?______________________________

Tuesday?______________ Wednesday?______________

25. What day comes just after Sunday?______________________________

Thursday?______________ Wednesday?______________

26. Name the months of the year______________________________

____

27. What month comes just before September?______________________________

January?______________ June?______________

28. What month comes just after November?______________________________

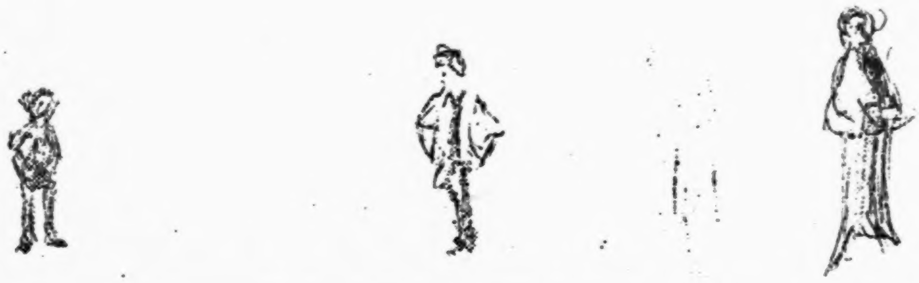
August?______________ February?______________

29. In what month does summer begin?______________________________

30. During which season do we have Halloween?______________________________

NO. CORRECT______________

TEST IV, B.



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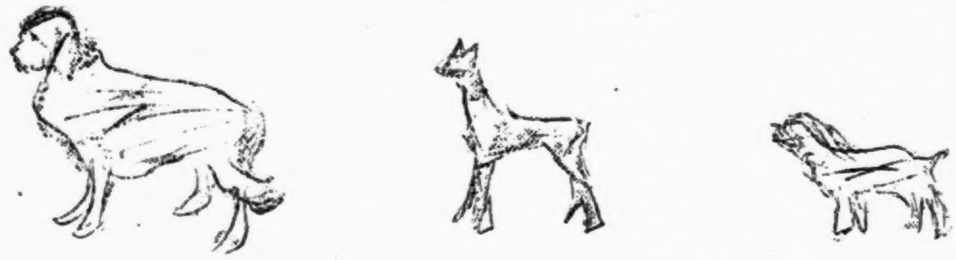

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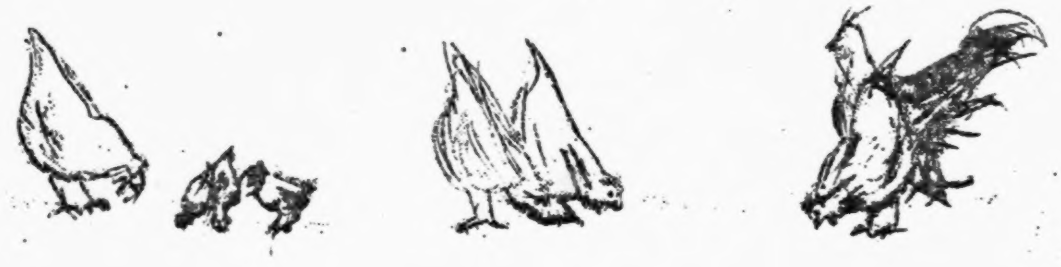

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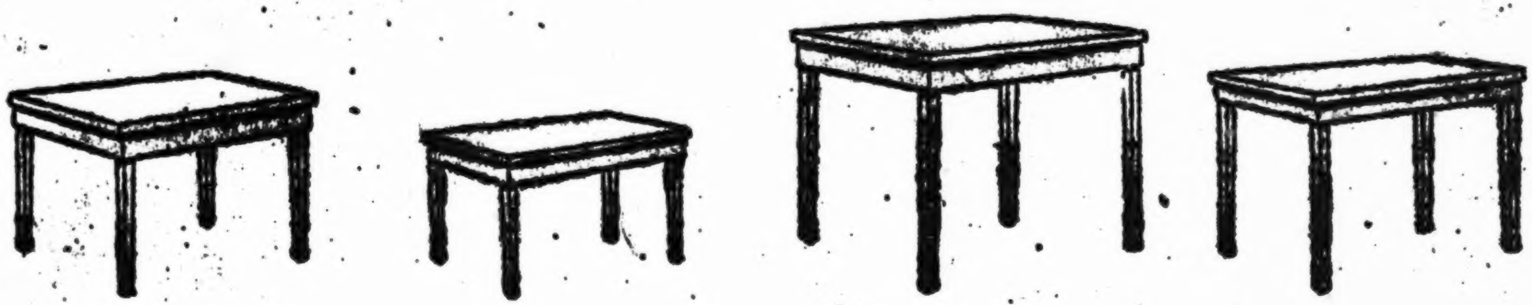

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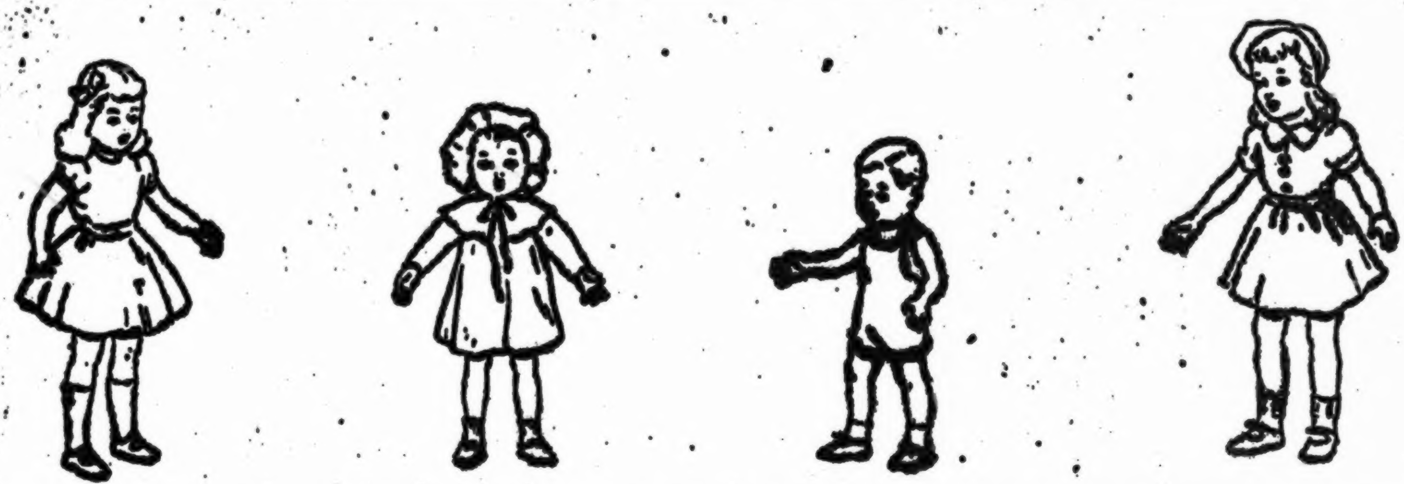

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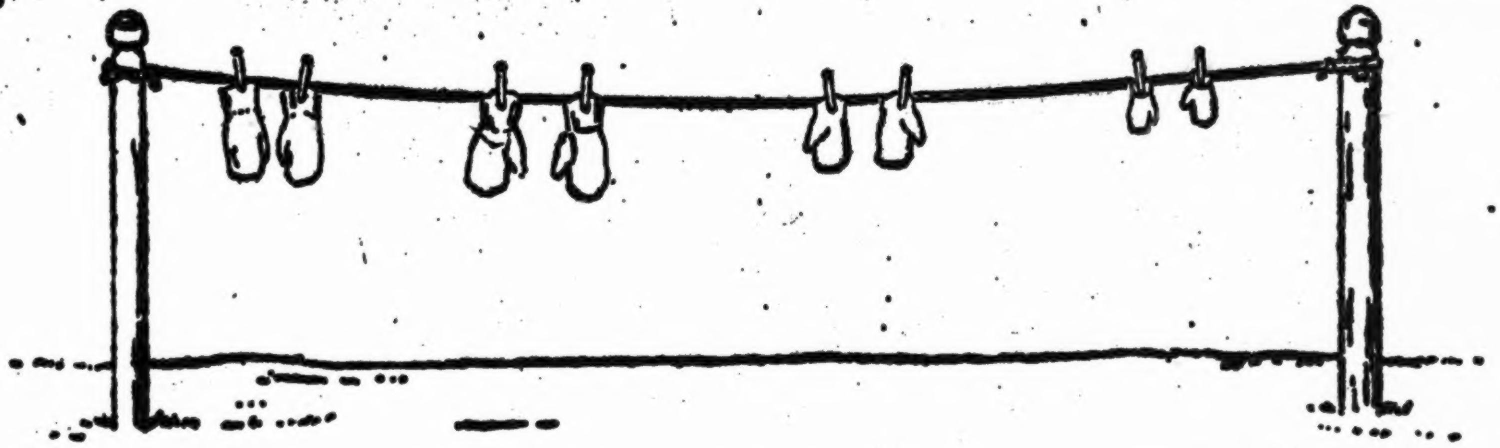

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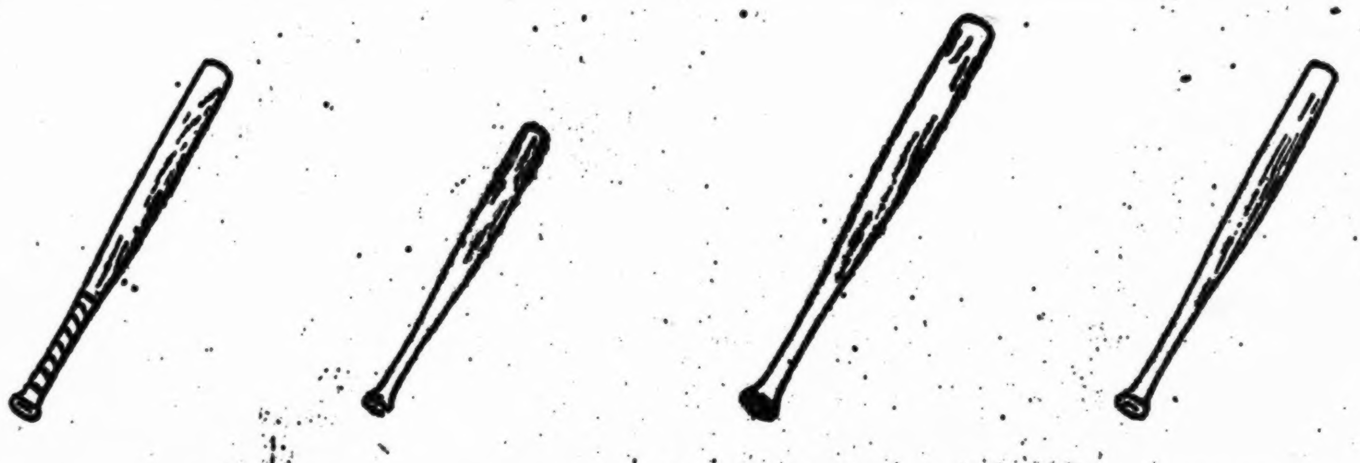

TEST IV. E. (Continued)

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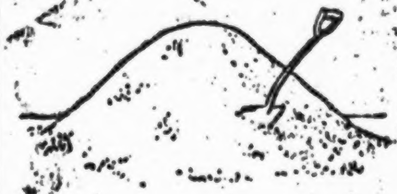
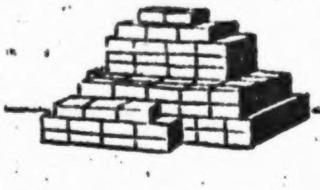
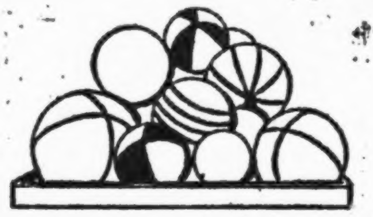
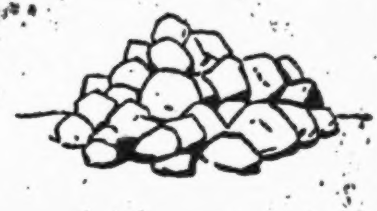

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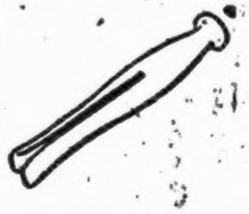
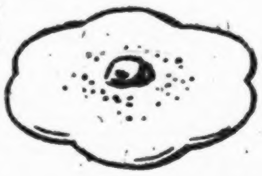
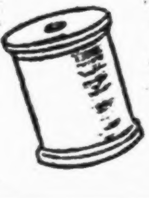
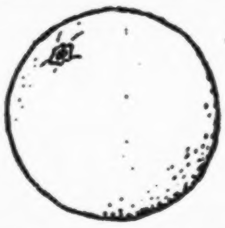

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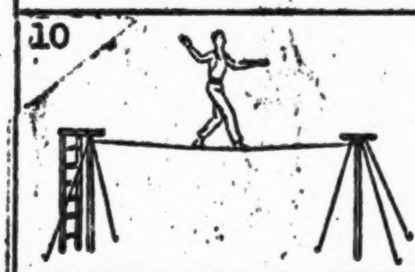
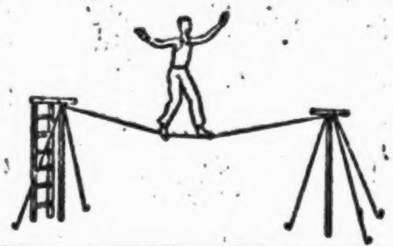
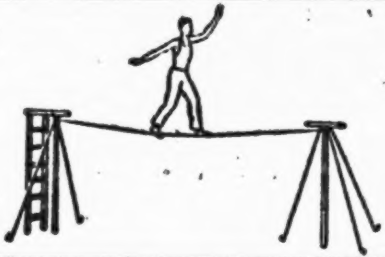
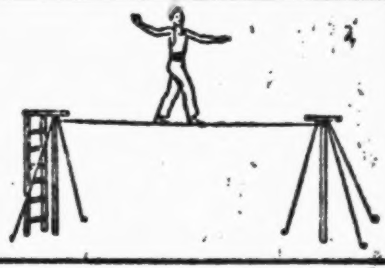

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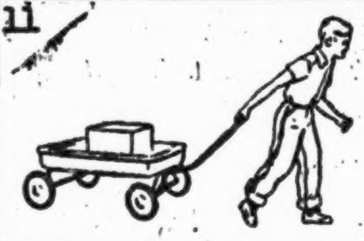
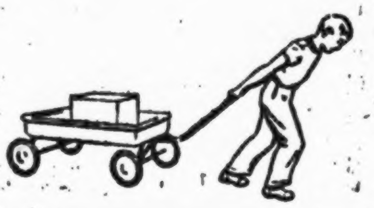
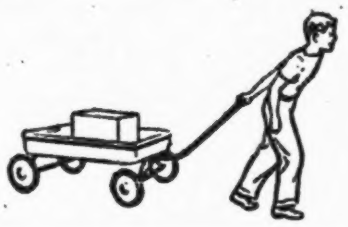
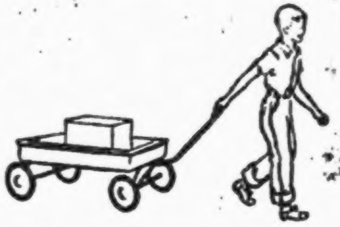

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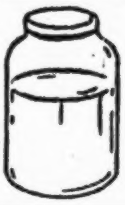
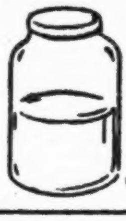
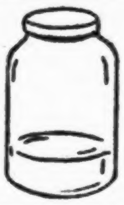
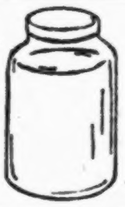

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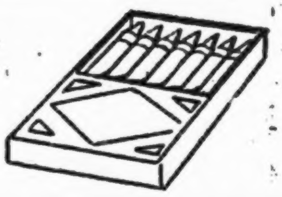
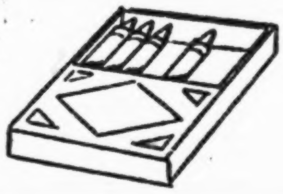
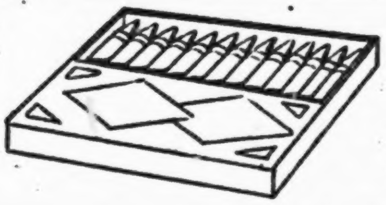
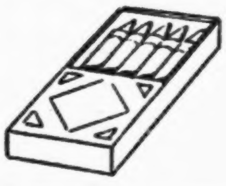

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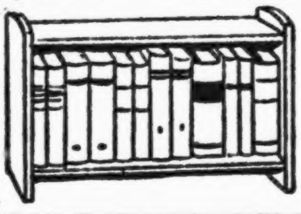
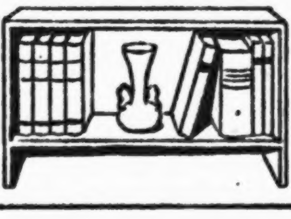
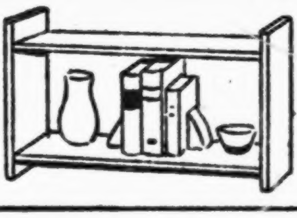
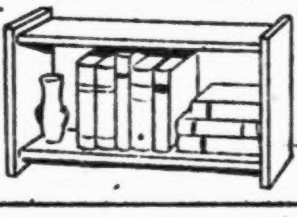

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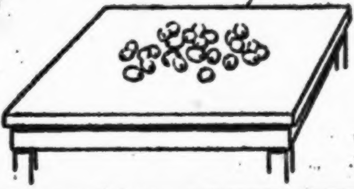
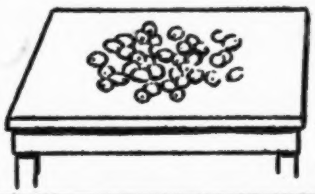
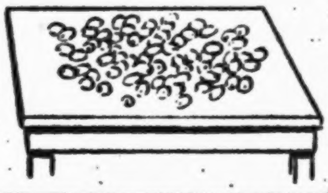
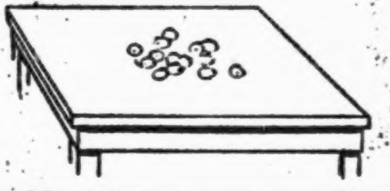

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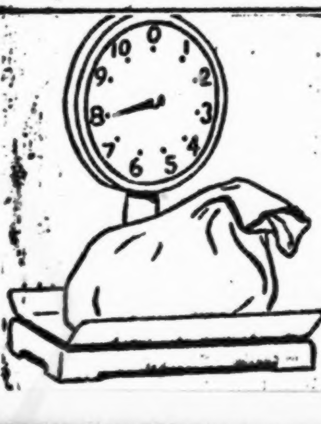
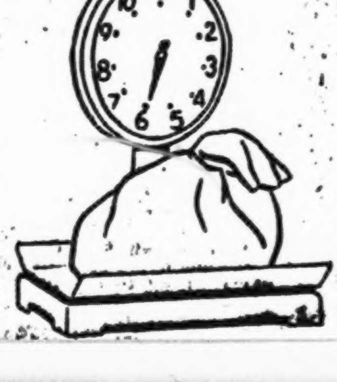
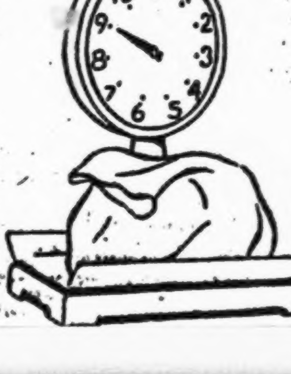
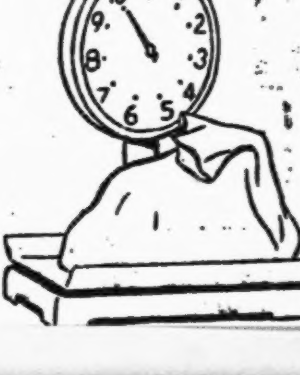
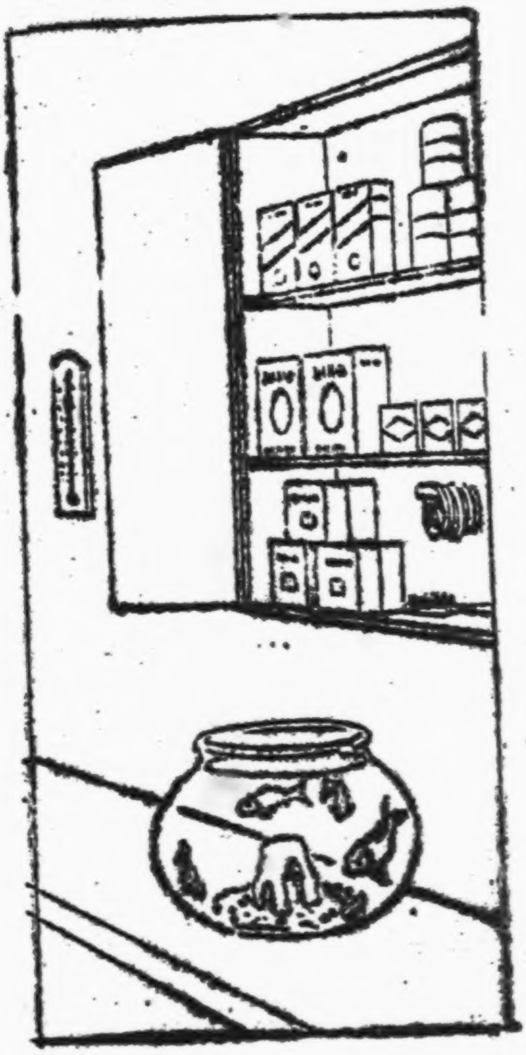





TEST IV, B. (Continued)

17 and 18.



RAW SCORE_____________

TEST IV-C

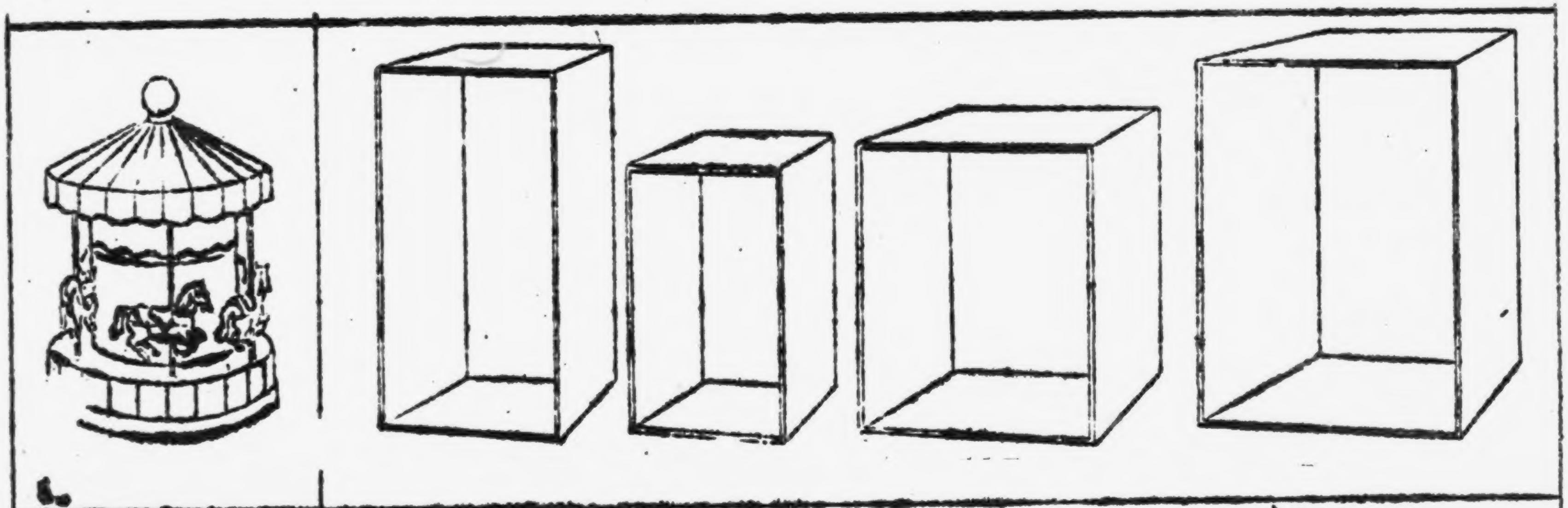
1. ______________________

2. ______________________

3. ______________________

SCORE: ______________________

TEST IV, D.



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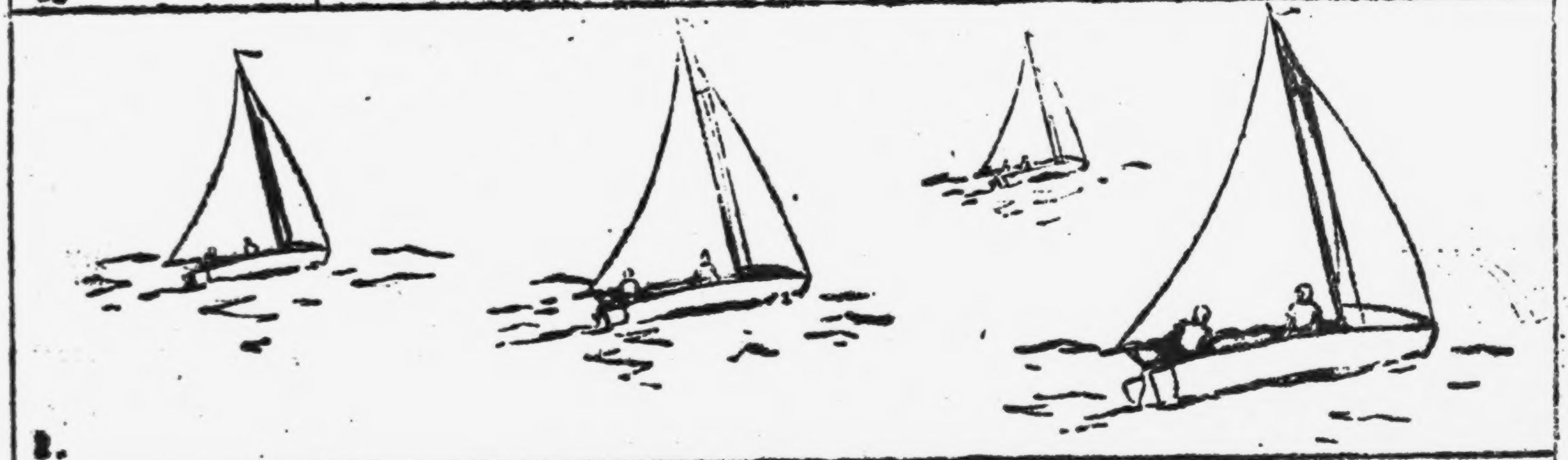

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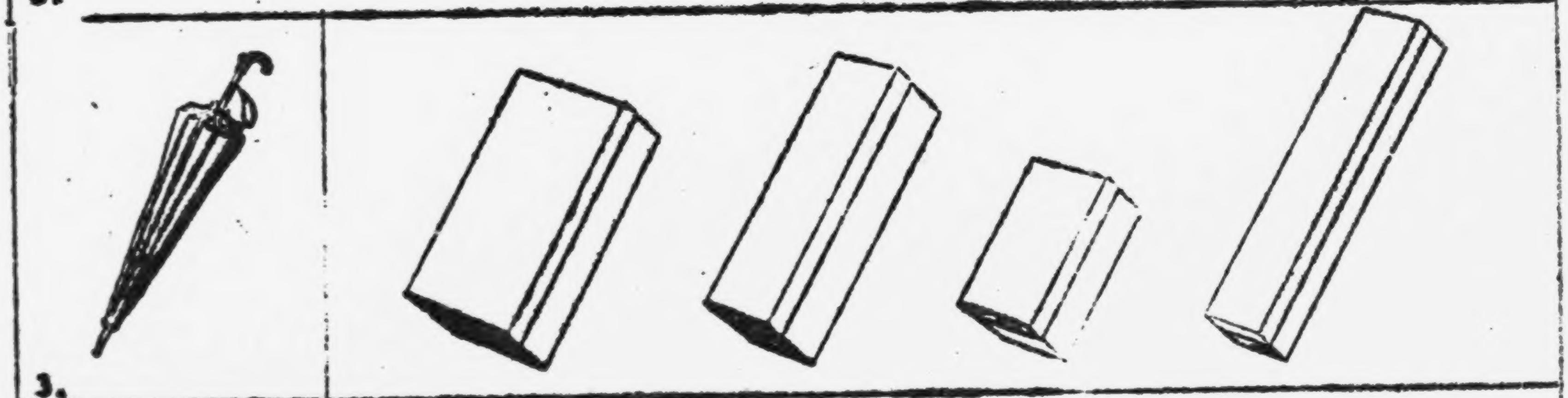

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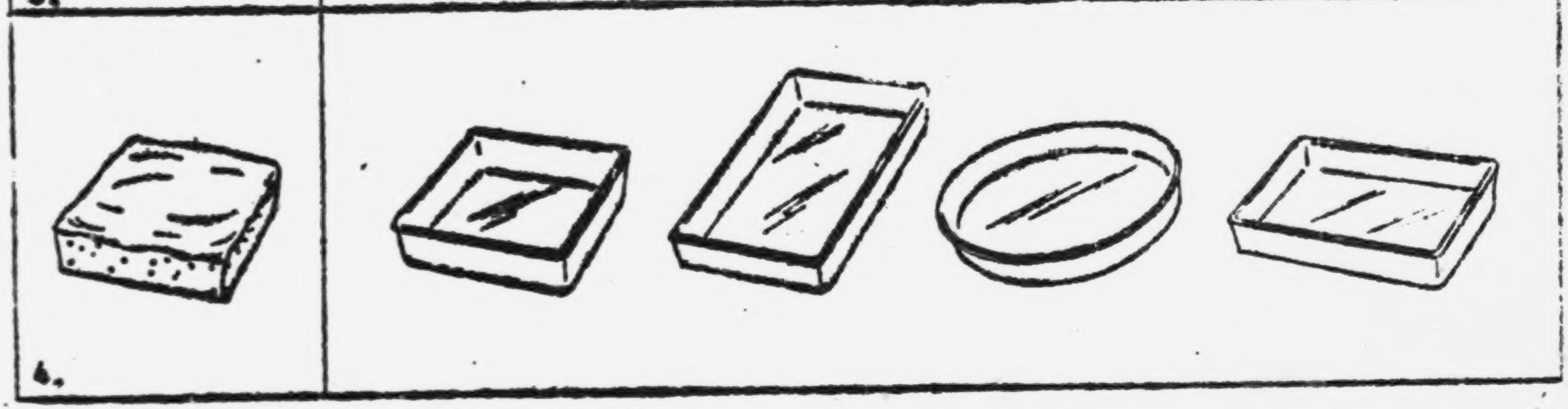

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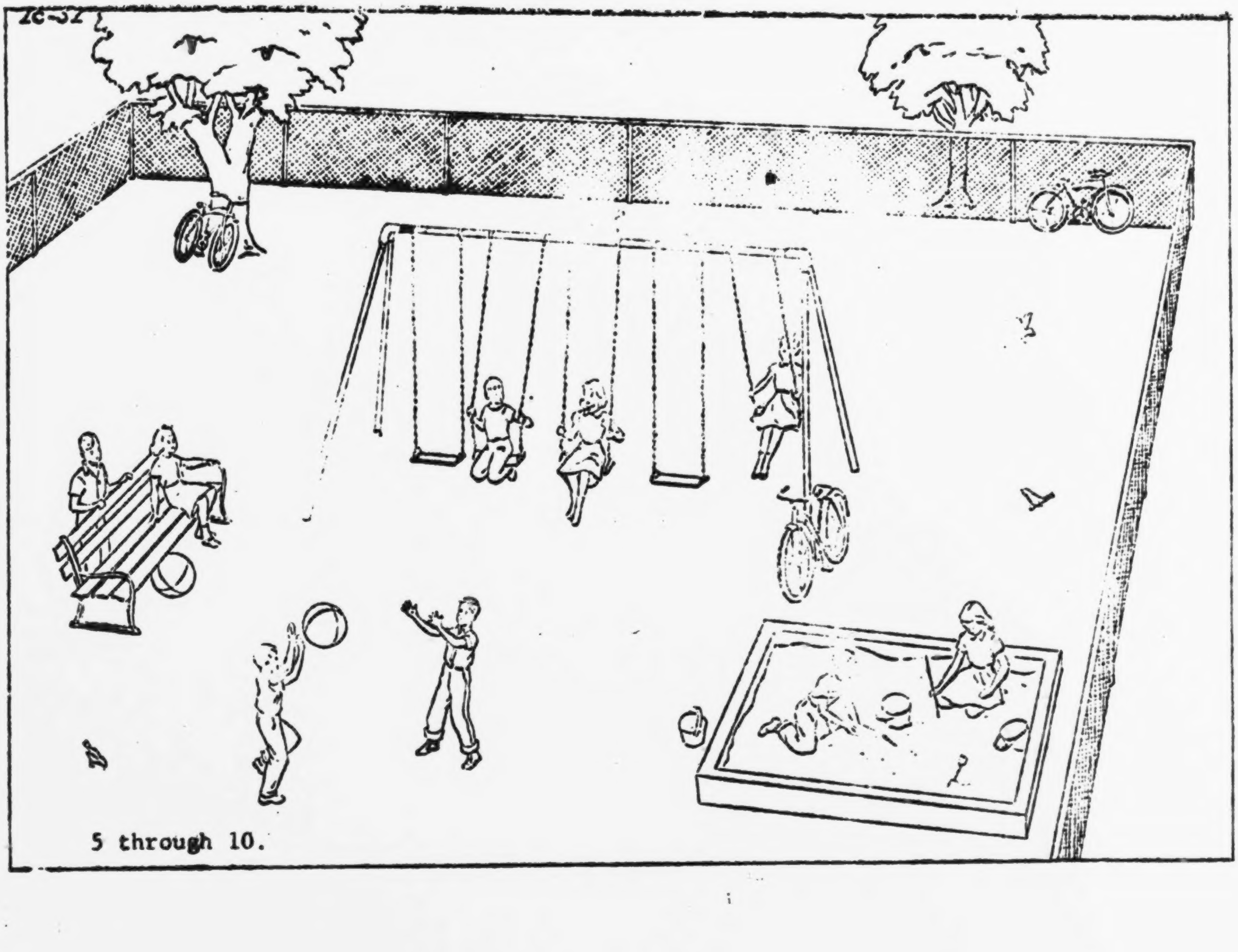
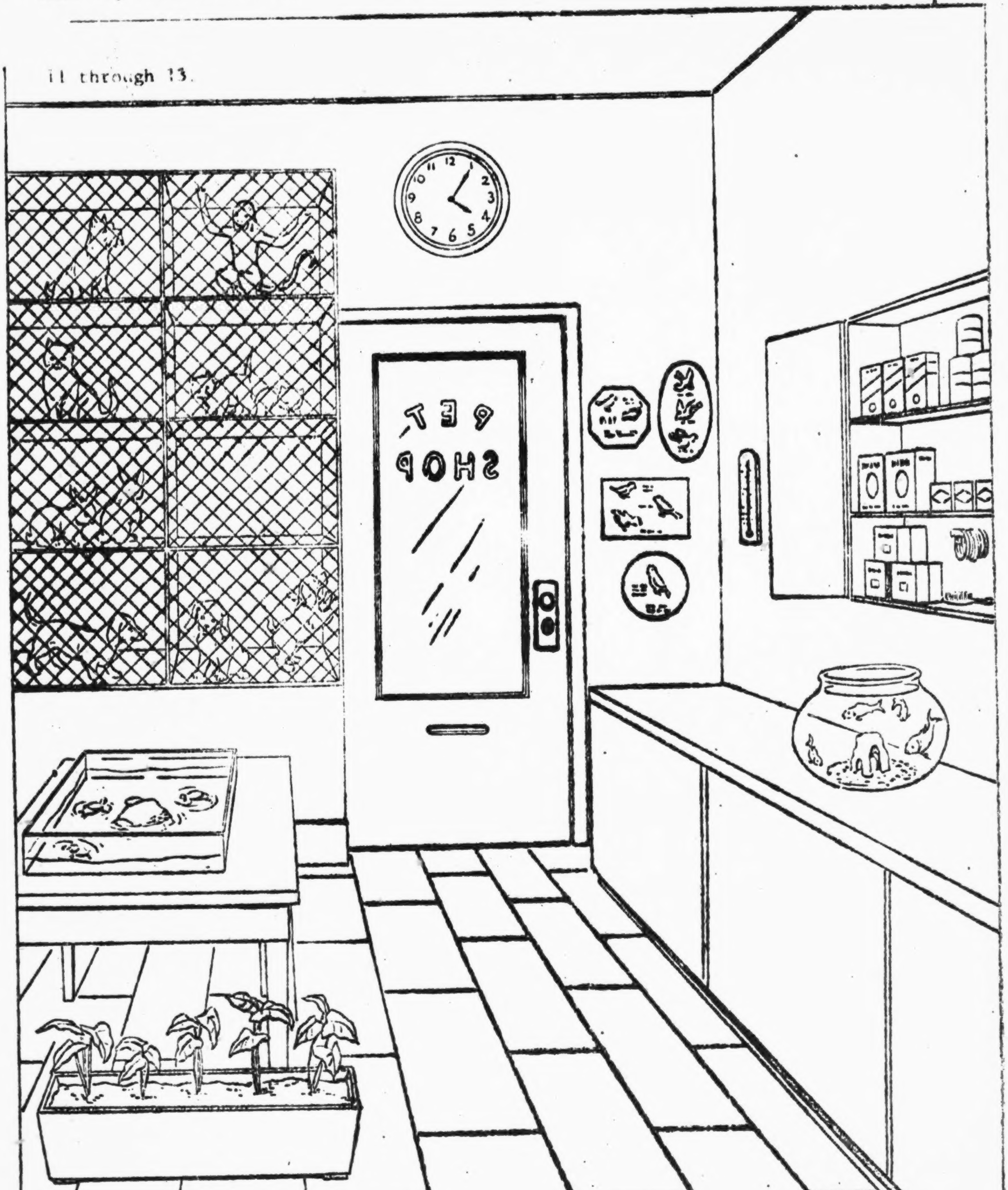
TEST IV, D. (Continued)

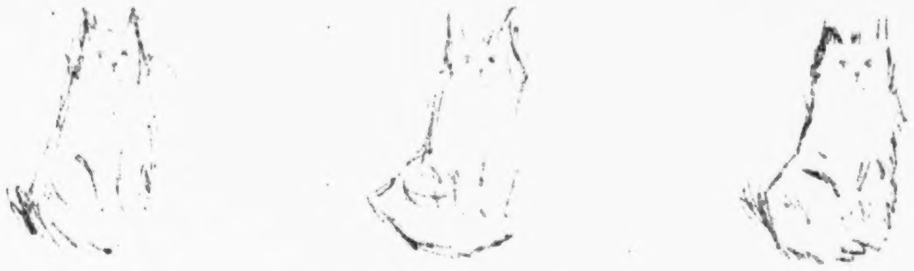


5 through 10.

11 through 13.



TEST IV-D (continued)



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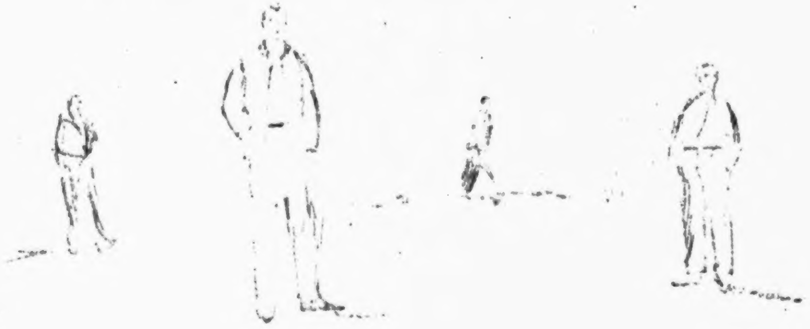

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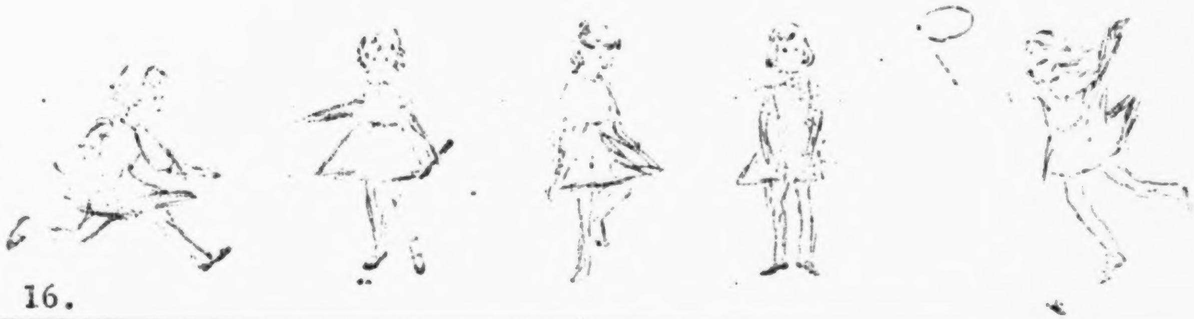


16.

RAW SCORE________________

TEST IV-F

1. Show me which way is right________________

2. Show me which way is left________________

3. Show me which way is up________________

4. Show me which way is down________________

5. Am I sitting in front of you or in back of you?________________

6. (Place two objects in front of the child; one close, one farther away, and then ask)

   Which one is closer to you?________________

7. Which one is farther from you?________________

8. Touch your fingers together over your head________________

9. Touch your fingers together under your chair________________

10. Where does the sun rise?________________

11. In what direction would you have to travel from here to California?________________

12. In what direction would you have to travel from here to New York?________________

SCORE:________________

TEST V-A

PUZZLE A:

TIME:________________________

METHOD:______________________

PUZZLE B:

TIME:________________________

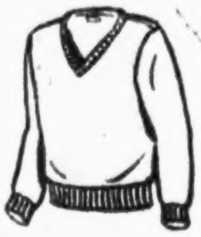
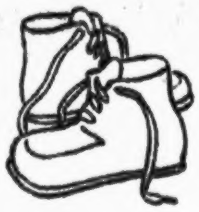
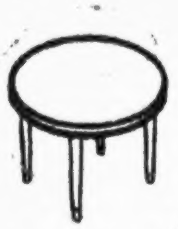
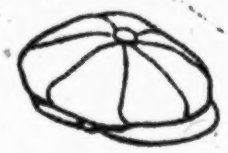
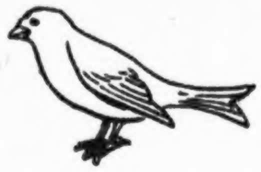
METHOD:______________________

SCORE:__________________________

TEST V., B.

Kg. -- Test 1

a.

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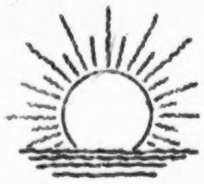
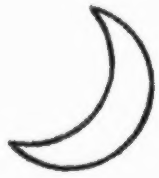
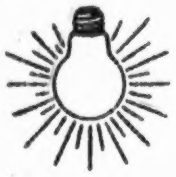
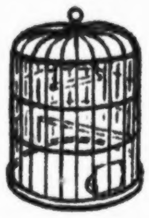
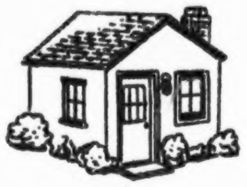

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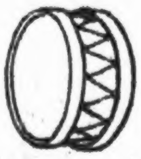
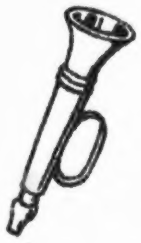
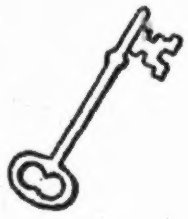
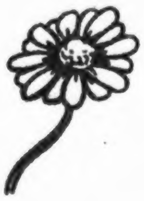
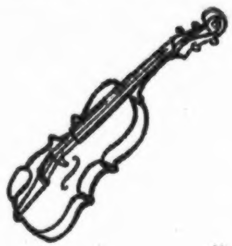

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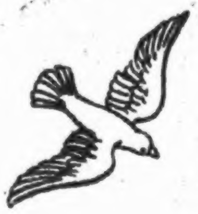
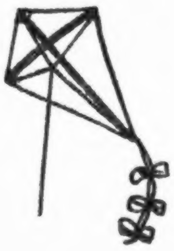
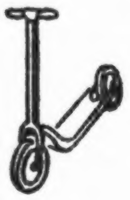
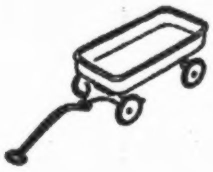
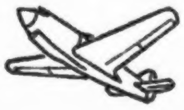

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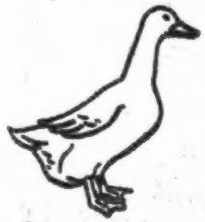
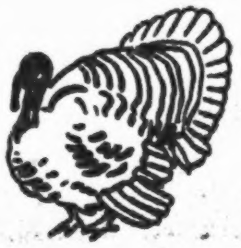
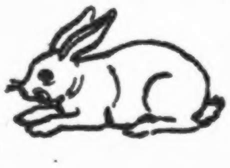
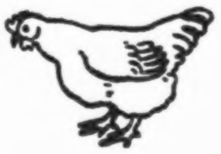
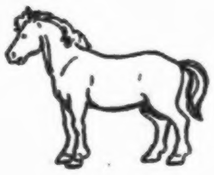

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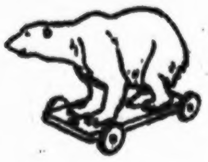

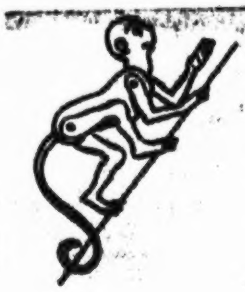

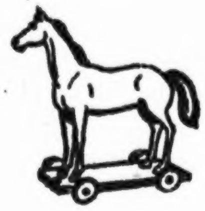

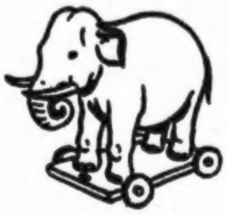

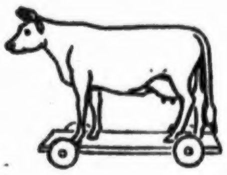

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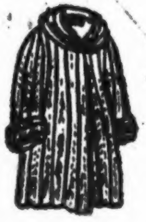

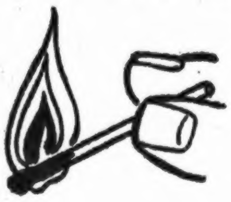

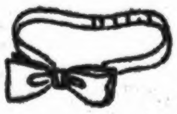

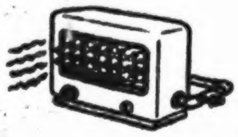

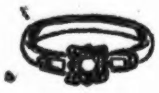

TOTAL RAW SCORE ________

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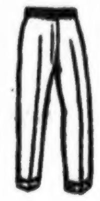
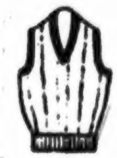
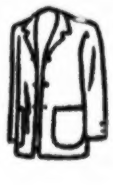
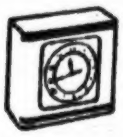
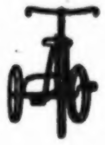

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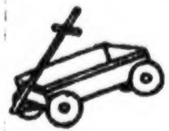
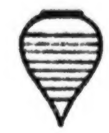
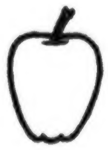
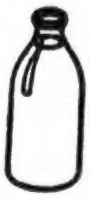
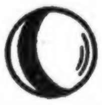

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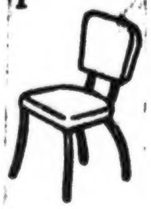
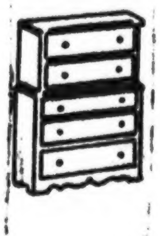
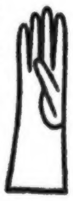
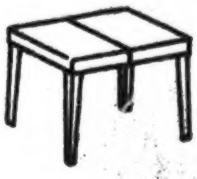
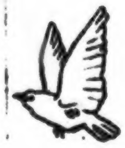

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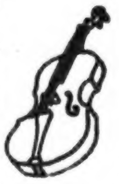
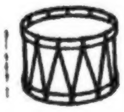
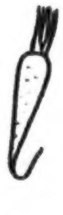
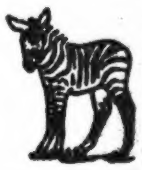
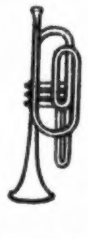

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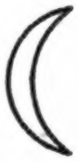
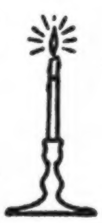
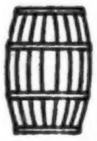
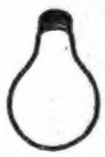
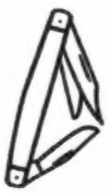

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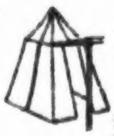
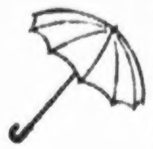
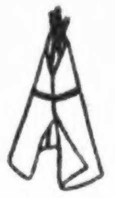
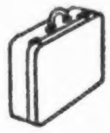
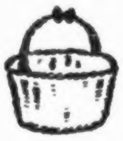

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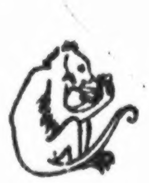
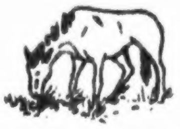
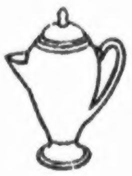
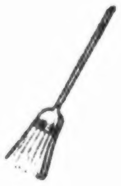
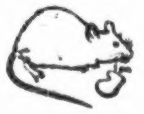

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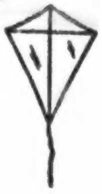
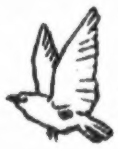
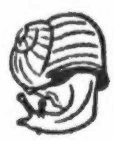
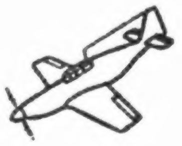
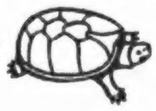

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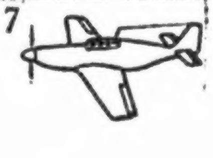
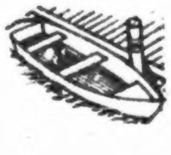
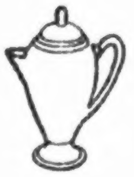
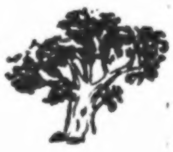
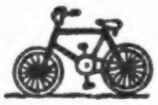

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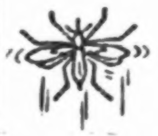
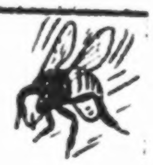
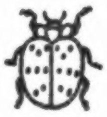
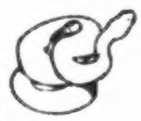
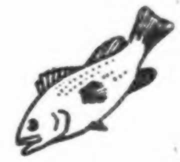

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TEST V. B. Gr. 1-3 -- Test 1

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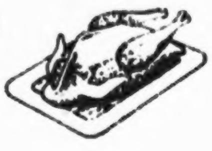
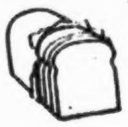
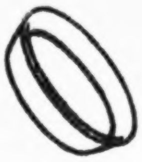
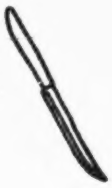
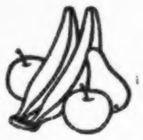

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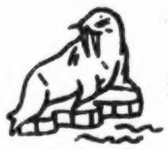
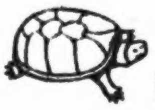
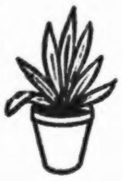
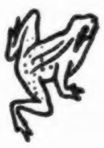
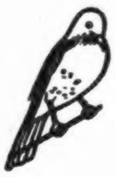

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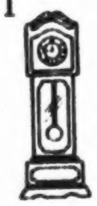
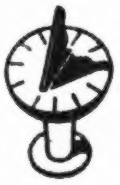
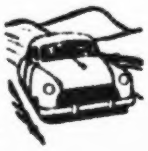
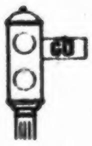
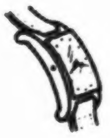

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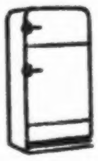
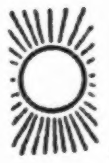
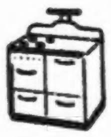
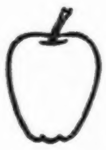
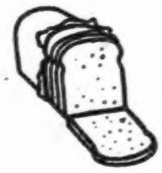

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RAW SCORE ____________

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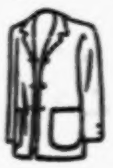
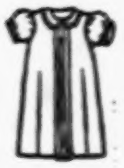
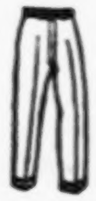
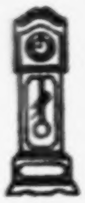
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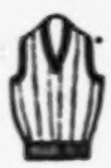
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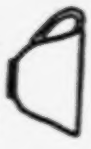
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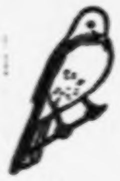
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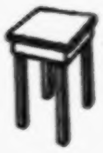
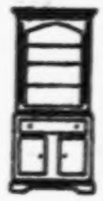
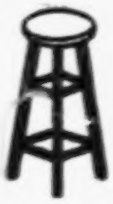
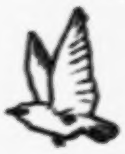
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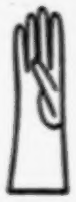
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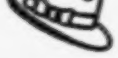
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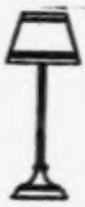
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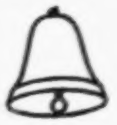
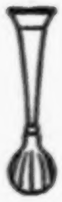
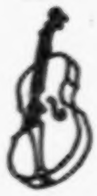
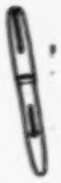
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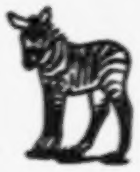
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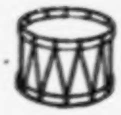
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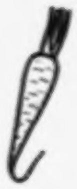
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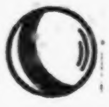
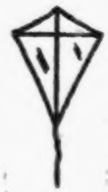
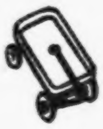
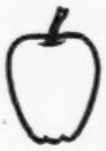
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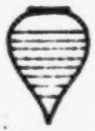
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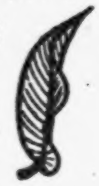
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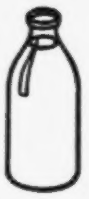
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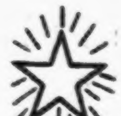
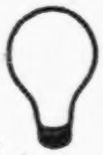

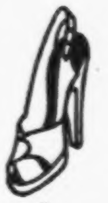
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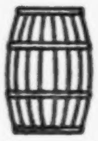
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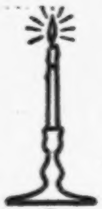
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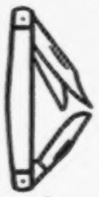
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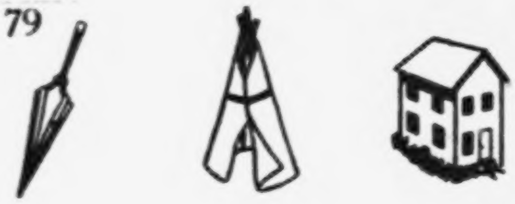

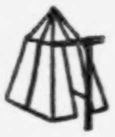
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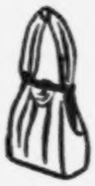
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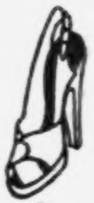
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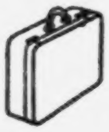
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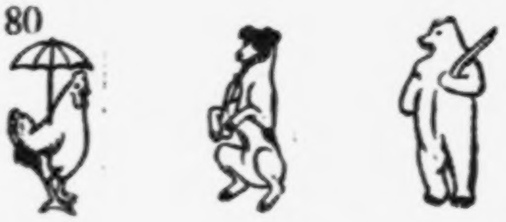

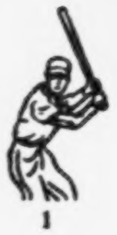
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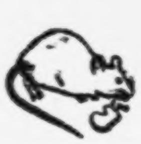
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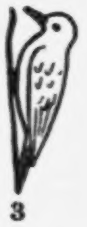
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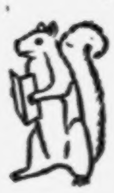
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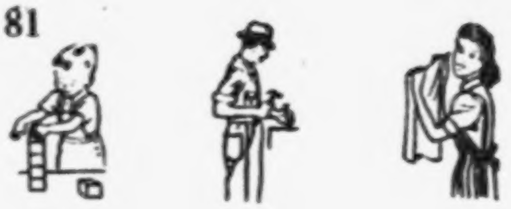

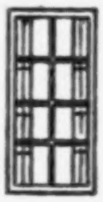
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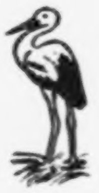
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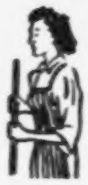
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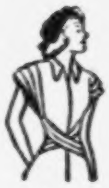
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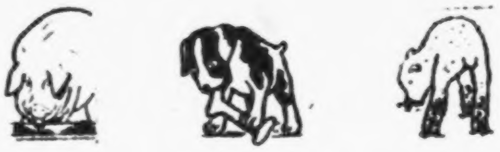

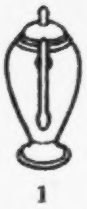
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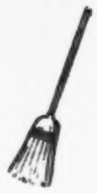
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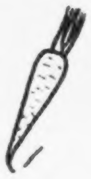
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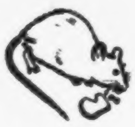
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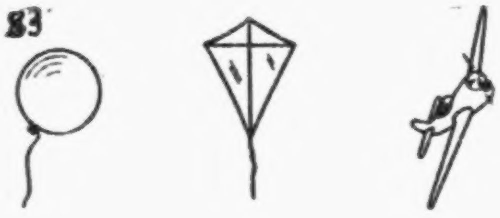

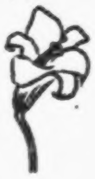
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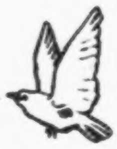
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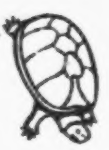
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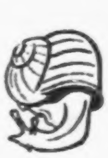
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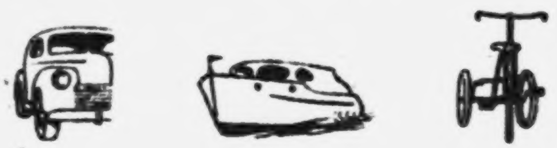

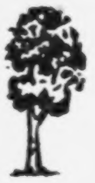
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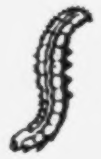
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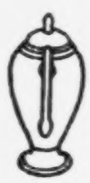
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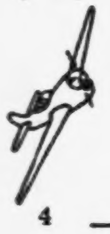
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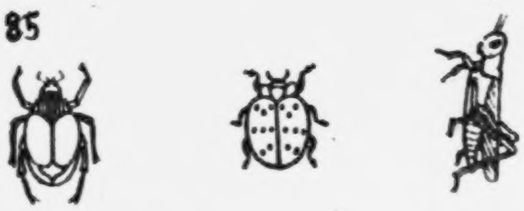

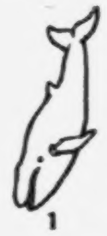
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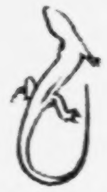
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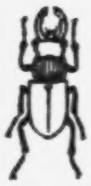
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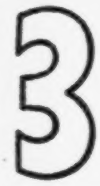
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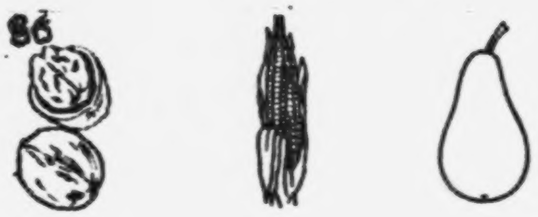

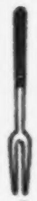
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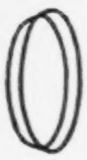
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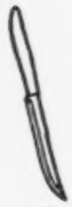
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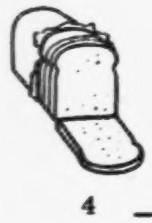
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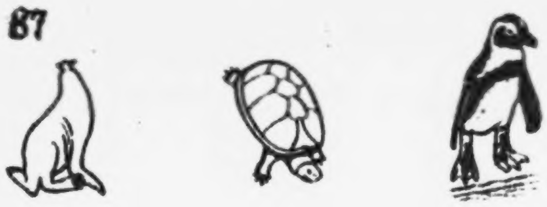

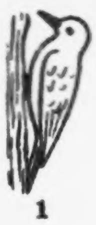
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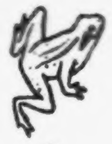
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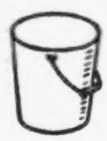
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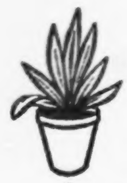
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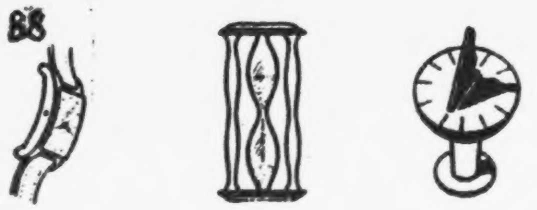

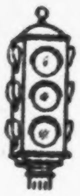
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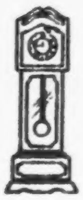
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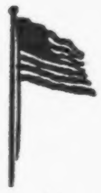
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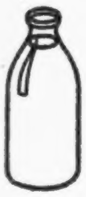
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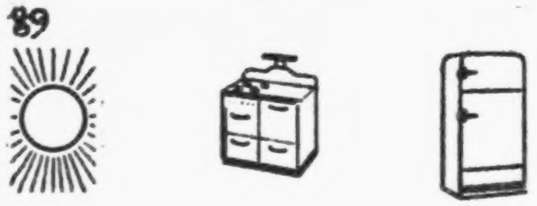

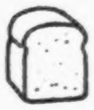
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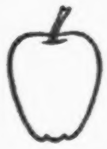
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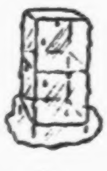
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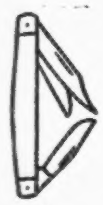
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RAW SCORE ________

TEST V-C

Animals____________________________________

Things to eat______________________________

Toys_______________________________________

SCORE:___________________

TEST V, D.

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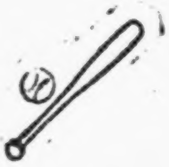
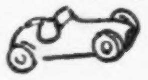
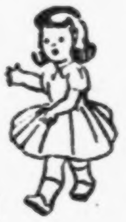
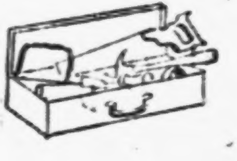
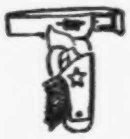

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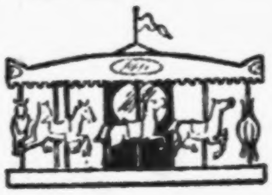
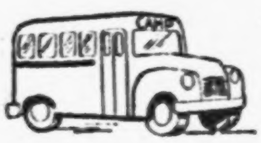

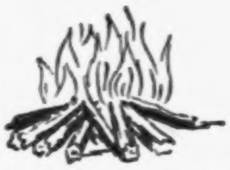

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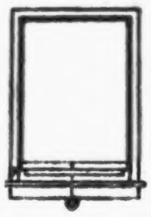
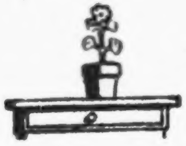
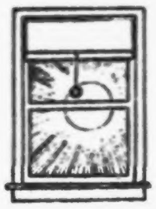

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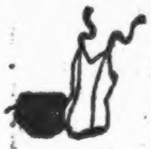
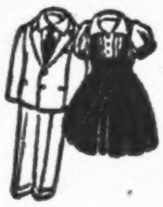
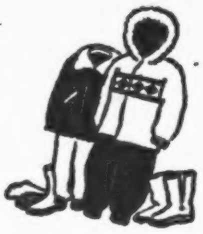

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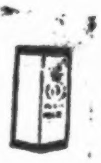
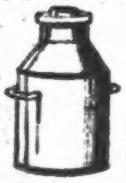
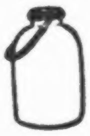
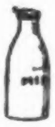
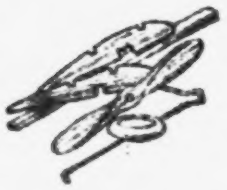
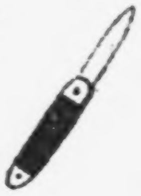
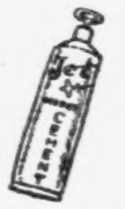





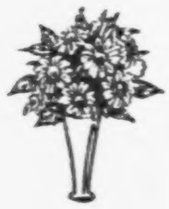
TEST V, D. (Continued)

6.









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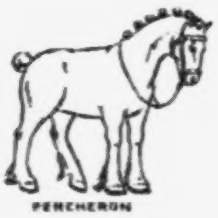
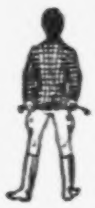
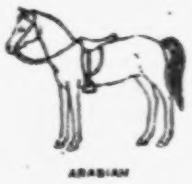
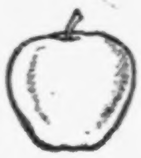
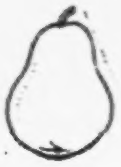


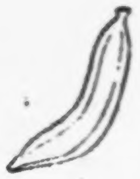


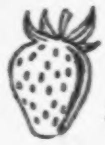


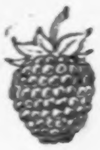
8:



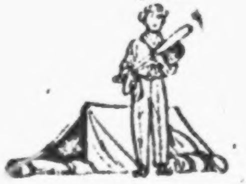


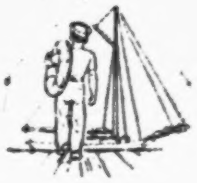


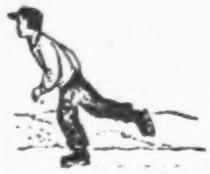




9.







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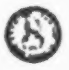
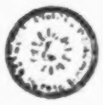
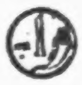


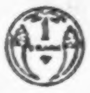
Shilling



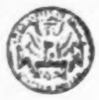
Peso



Lira



Franc



Quarter

TEST V-D - page 3

Sample:	winter	spring	summer	fall

* * * * * * * * * * *

11.	lions	tigers	dogs	rabbits
12.	pleasant	warm	tiresome	cold
13.	early	late	sleepy	dead
14.	spring	winter	summer	fall
15.	games	sale	wood	dinner
16.	garden	sing	shoot	fight
17.	plains	fire	mountains	forests
18.	mild	cold	hot	balmy
19.	beautiful	strong	old	light
20.	sand	plants	woods	buckets

SCORE____________________

TEST V-E

1. ● ● ● ● ● Ans.________

2. ● ● ● ● ● ● ● ● ● ● Ans.________

3. ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● Ans.________

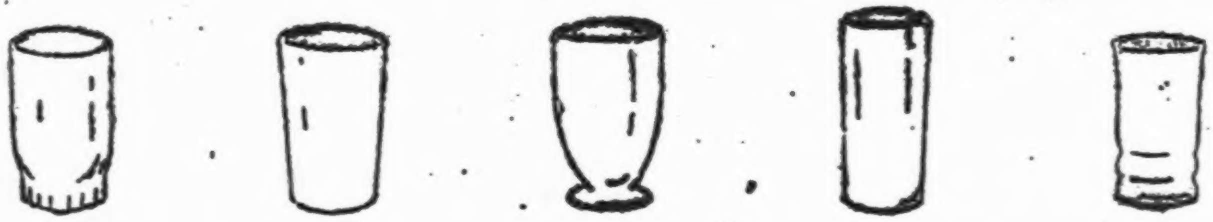
4. ______________________________

5. ______________________________

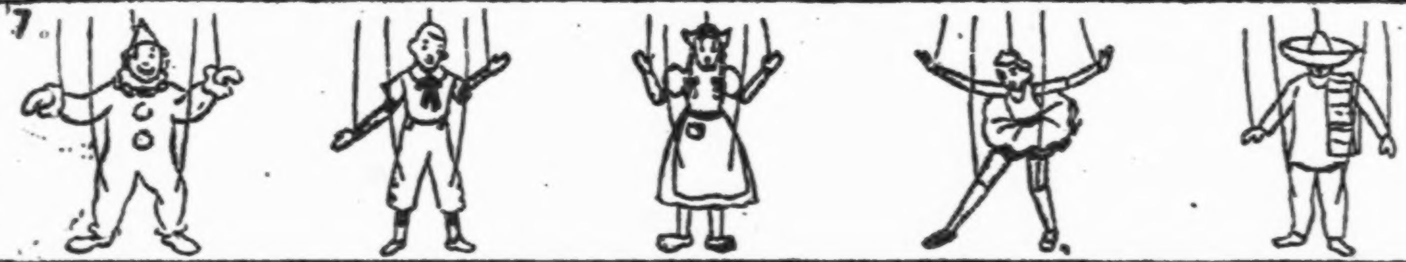
(continued on next page

TEST V, B. (Continued)

6.



7.



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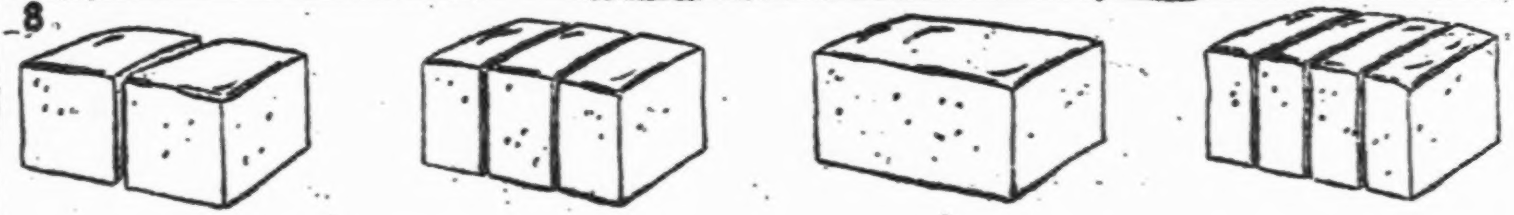

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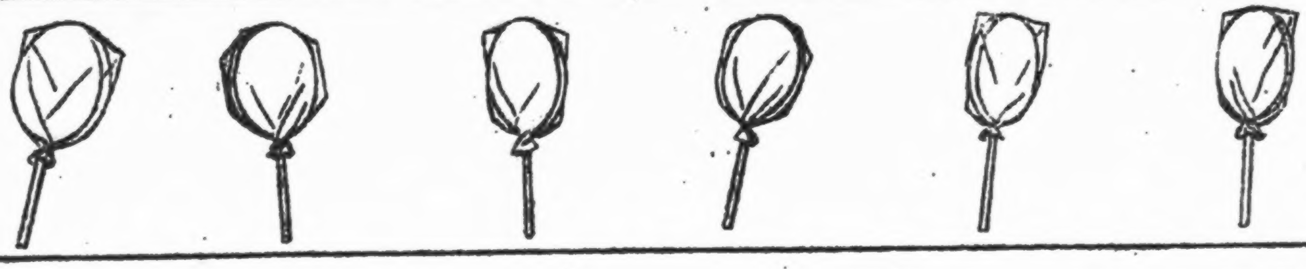

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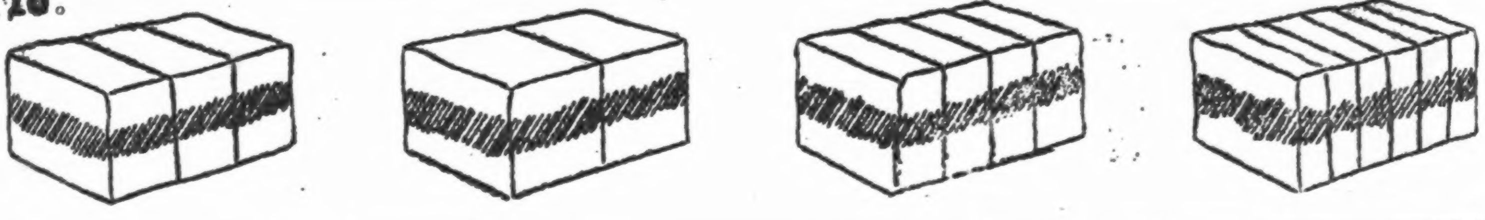


TEST V-E - page 3

11. ____

12. ____

13. ____

14. ____

15. ____

NO. CORRECT______________

TEST VI-A

SCORES:

1.__________________

2.__________________

3.__________________

4.__________________

5.__________________

VI-A
TOTAL SCORE__________________

TEST VI-B

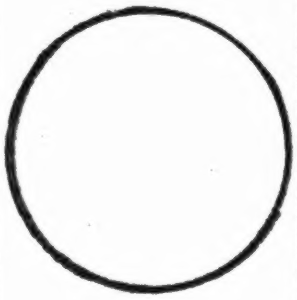
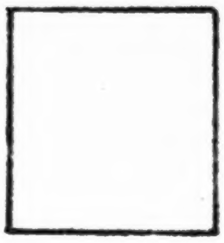
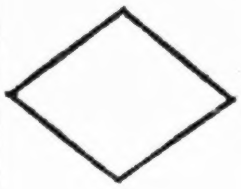
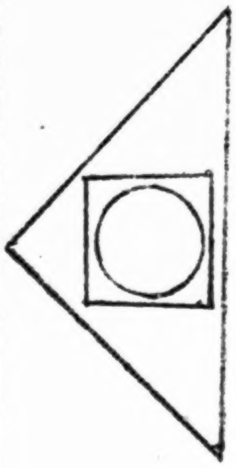
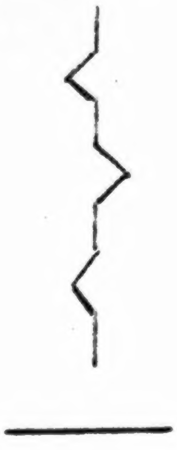
SCORES:

1.__________________

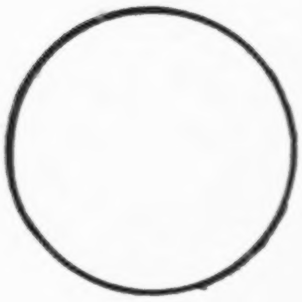
2.__________________

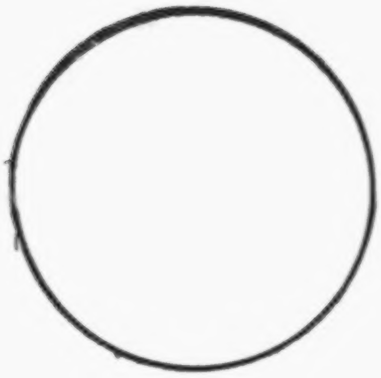
VI-B
TOTAL SCORE__________________

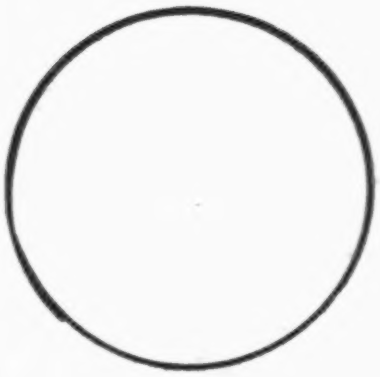
TEST VI-A

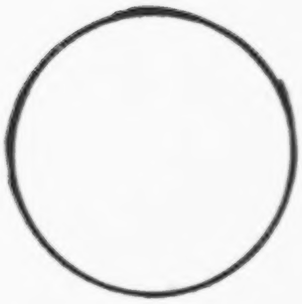
					

TEST VI-B









TEST VII

JUMPING (circle):

A	0	1
B	0	1
C	0	1
D	0	1
E	0	1
F	0	1
G	0	1
H	0	1

SCORE_______________

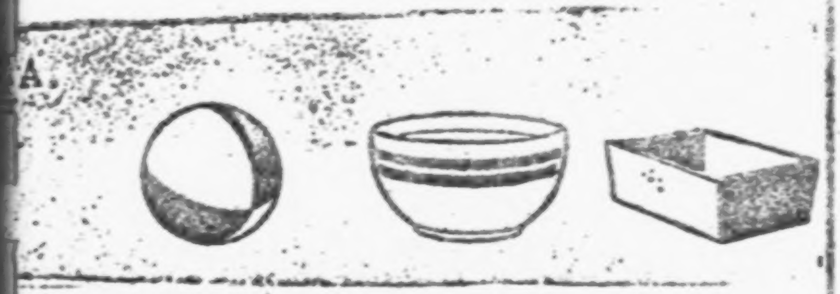
IDENTIFICATION (circle):

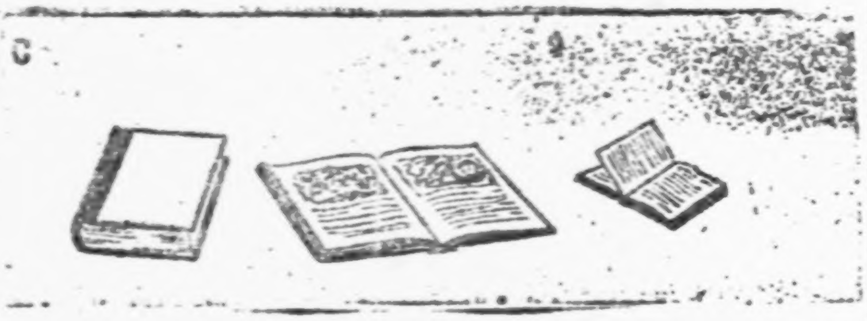
a	0	1
b	0	1
c	0	1
d	0	1
e	0	1
f	0	1
g	0	1
h	0	1
i	0	1

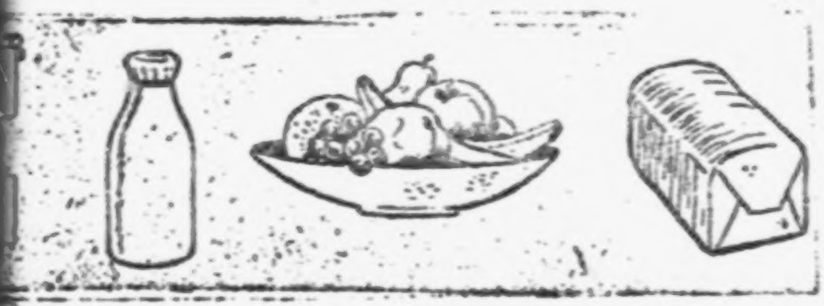
SCORE_______________

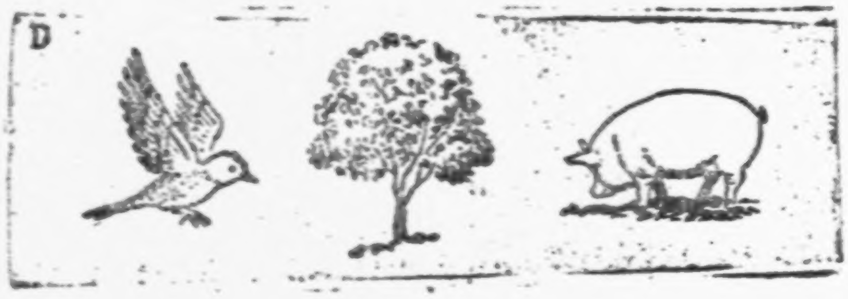
TEST VIII.

(Samples)





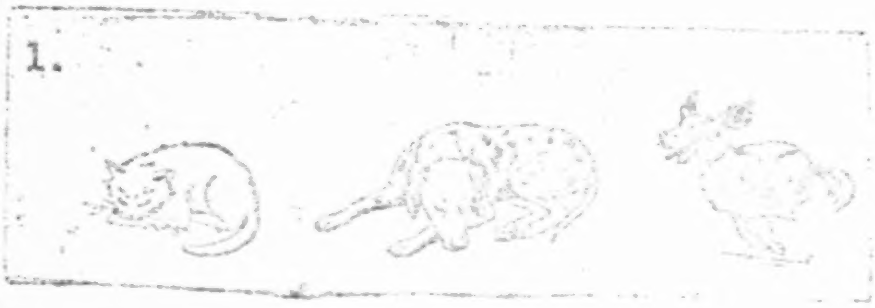




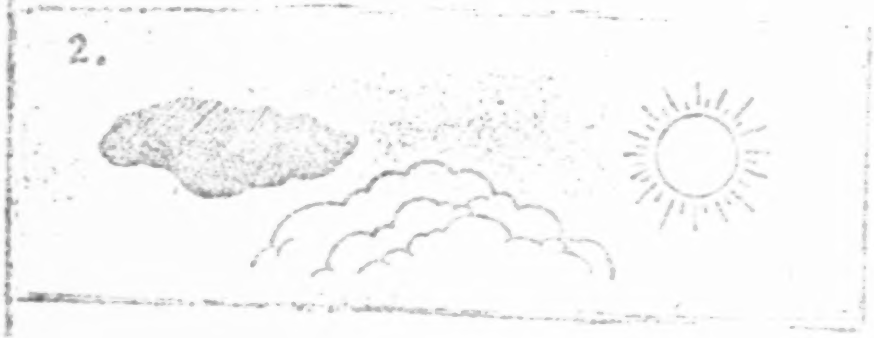
TEST VIII, continued

BEGIN TEST.

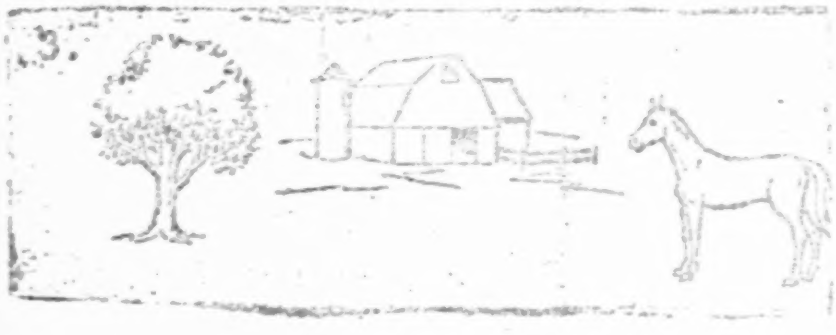
1.



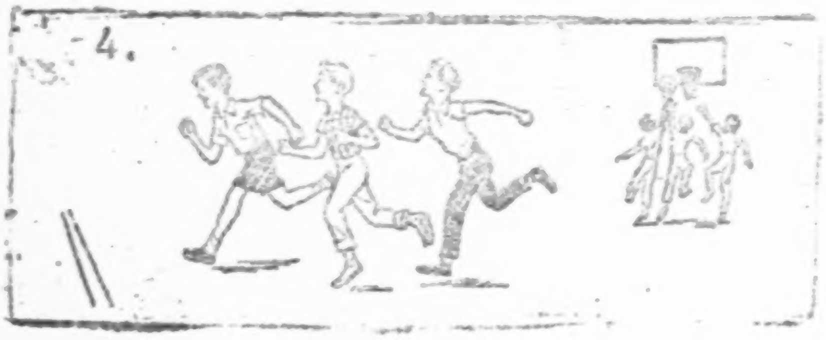
2.



3.



4.



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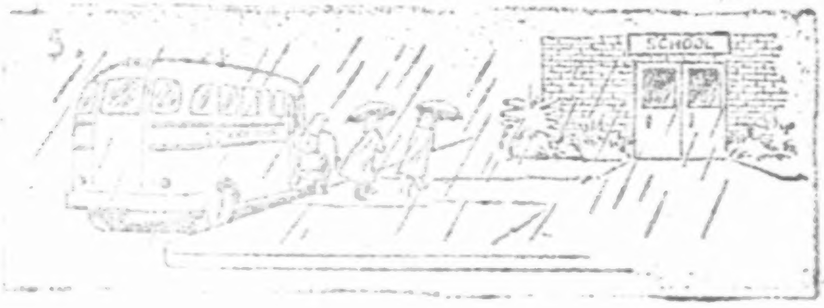
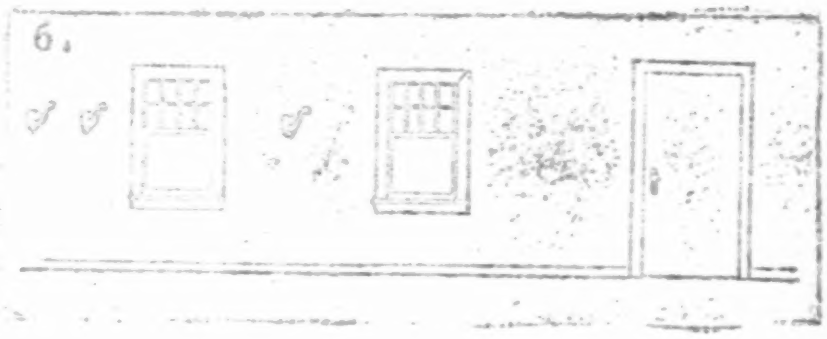
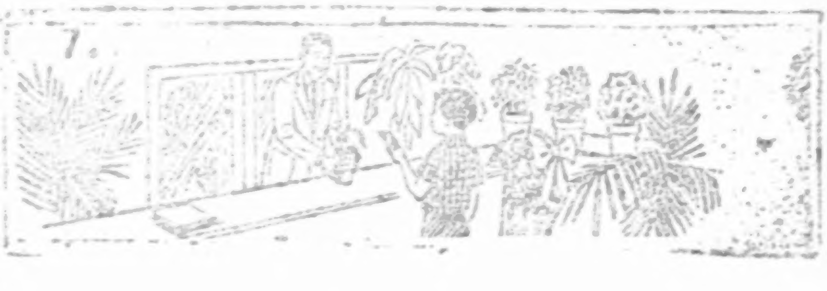


6.



7.



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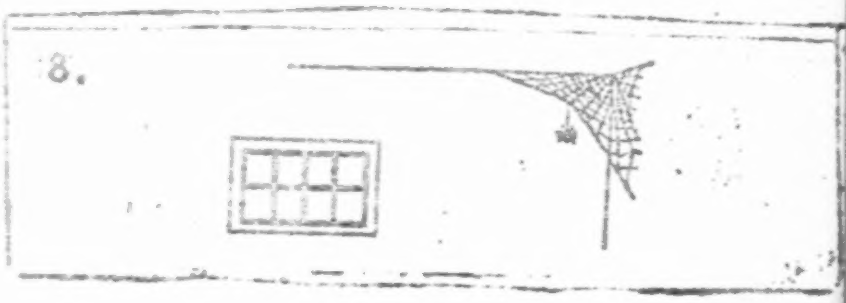
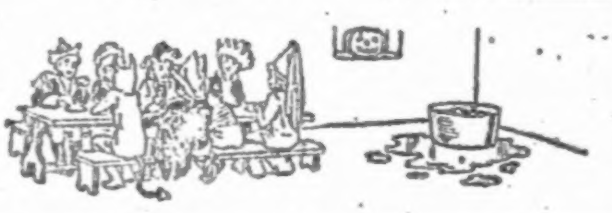
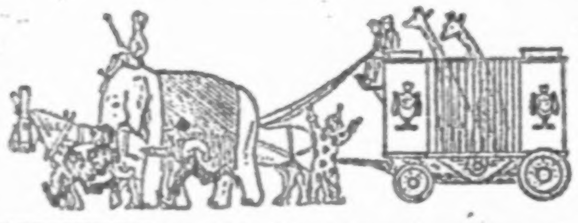


TEST VIII, A. (continued)

9.



0.



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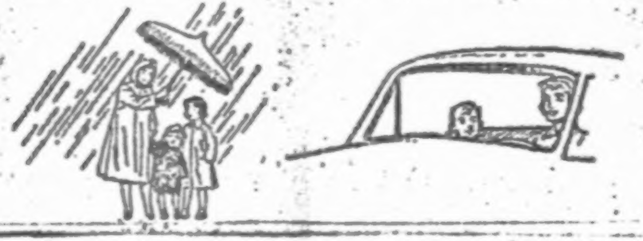
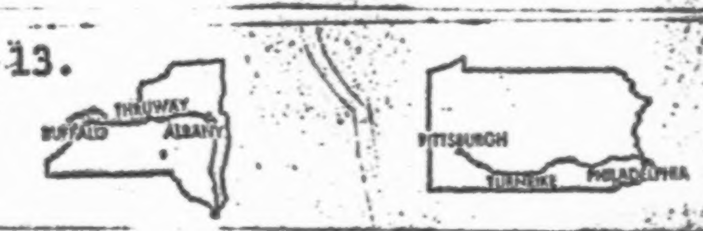
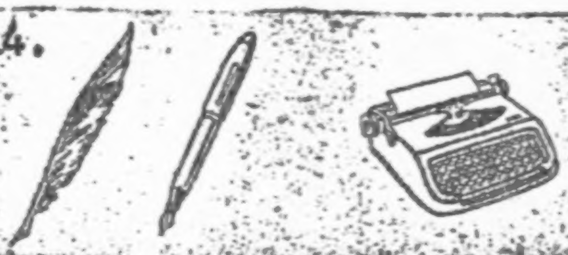


2.

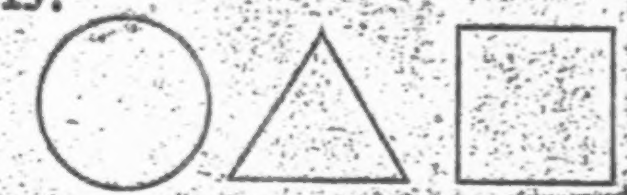
13.


THRUWAY
BUFFALO
ALBANY
PITTSBURGH
TURNPIKE
PHILADELPHIA

14.



15.

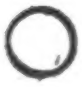


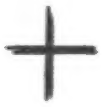
TEST IX-D

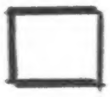
		SCORE	
1.	Right cheek - left hand	0	1
2.	Left cheek - right hand	0	1
3.	Right cheek - right hand	0	1
4.	Left cheek - left hand	0	1
5.	Right cheek - left cheek	0	1
6.	Right hand - left hand	0	1
7.	Right cheek - left hand	0	1
8.	Left cheek - right hand	0	1
9.	Right cheek - right hand	0	1
10.	Left cheek - left hand	0	1
11.	Right cheek - left cheek	0	1
12.	Right hand - left hand	0	1
13.	Right cheek - left hand	0	1
14.	Left cheek - right hand	0	1

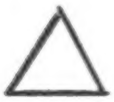
SCORE____________________

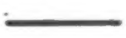
TEST IX-E

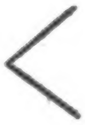
1. Circle  ____________________

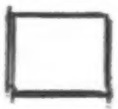
2. Plus sign  ____________________

3. Box  ____________________

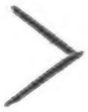
4. Triangle  ____________________

5. Short straight line  ____________________

6. Angle point left  ____________________

7. Box  ____________________

8. Half moon ____________________

9. Angle point right  ____________________

SCORE: ____________________

TEST IX-F

1. R________________

2. L________________

3. R________________

4. L________________

5. R________________

6. L________________

7. R________________

8. L________________

9. R________________

10. L________________

SCORES:

LEFT________________

RIGHT________________

TOTAL________________

APPENDIX C

Tables: 17
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Table 17

Comparison of Experimental and Control Groups on Standard and C-M Tests

Grade 1 - N = 100

Test	Experimental Mean	Experimental S.D.	Control Mean	Control S.D.	Total Mean	Total S.D.	F
Frostig I	9.8	2.2	11.1	2.3	10.5	2.3	9.0
Frostig II	9.7	1.9	10.3	1.6	10.0	1.8	3.3
Frostig III	7.8	2.2	10.5	2.4	9.2	2.7	33.9**
Frostig IV	10.0	1.9	11.2	1.8	10.6	1.9	11.3
Frostig V	10.7	1.4	11.6	1.1	11.1	1.3	12.5**
Raven %ile	52.0	27.5	69.9	23.7	61.0	27.2	12.3**
ITPA-Vis.Dec.	14.4	2.6	15.6	2.3	15.0	2.5	6.3*
ITPA-Mot.Enc.	14.0	3.6	15.2	3.6	14.6	3.6	2.9
ITPA-Voc.Enc.	17.4	4.9	19.0	6.1	18.2	5.6	2.2
Bender	0.6	0.9	-0.2	0.8	0.2	1.0	21.3**
I-A	12.3	4.3	15.4	3.4	13.9	4.2	15.4**
I-B	14.8	5.3	20.8	4.0	17.8	5.5	43.3
I-C	10.9	1.5	11.5	1.7	11.2	1.6	1.3
I-D	7.7	1.6	8.4	1.5	8.1	1.6	5.3*
I-E	8.6	3.0	11.6	3.7	10.1	3.7	19.8**
I-F	26.5	20.4	43.8	21.5	35.1	22.7	15.5**
II-A	18.6	5.1	21.1	4.8	19.9	5.1	6.4*
II-B	15.1	4.3	19.9	4.0	17.5	4.8	33.2**
III-A	12.9	3.2	14.6	2.3	13.7	2.9	10.7
III-B %	36.7	22.1	44.9	18.6	40.8	20.8	3.9
III-C	10.5	7.3	14.2	9.2	12.4	8.5	5.0*
III-D	8.1	2.5	9.1	2.6	8.6	2.6	3.4
III-E	6.0	1.2	6.6	0.7	6.3	1.0	7.4
IV-A	14.2	3.3	18.4	4.5	16.3	4.5	26.9**
IV-B	14.8	2.0	15.9	1.4	15.4	1.8	10.1**
IV-C	2.3	2.7	3.3	2.7	2.8	2.7	3.9
IV-D	12.4	1.9	13.4	1.5	12.9	1.8	7.6**
IV-E	4.8	0.5	4.8	0.5	4.8	0.5	0.2
IV-F	8.2	1.0	8.8	1.0	8.5	1.1	6.6*
V-A-Method	1.6	0.7	2.1	0.7	1.9	0.7	9.8**
V-A-Time	0.6	1.0	-0.2	0.9	0.2	1.0	11.7**
V-B-%	5.2	3.7	1.1	1.2	74.0	19.1	3.7
V-C	17.0	4.6	21.1	4.7	19.1	5.1	19.4**
V-D	12.6	3.0	14.6	2.5	13.6	2.9	13.3**
V-E	10.0	2.2	11.1	1.5	10.5	2.0	7.9**
VI-A-Total	8.4	1.6	10.1	1.6	9.2	1.8	28.4**
VI-B-Total	2.7	0.9	3.5	1.3	3.1	1.2	12.8**

Table 17 - page 2

Comparison of Experimental and Control Groups on Standard and C-M Tests

Grade 1 - N = 100

	Experimental		Control		Total		
Test	Mean	S.D.	Mean	S.D.	Mean	S.D.	F
VII-Forward	1.0	0.2	1.0	0.0	1.0	0.1	2.1
VII-Backward	0.6	0.5	0.8	0.4	0.7	0.5	2.0
VII-Sidewise	0.8	0.4	1.0	0.1	0.9	0.3	9.7**
VII-Jumping	4.7	1.8	5.9	1.8	5.3	1.9	11.5**
VII-Identification	7.2	1.3	7.9	1.2	7.6	1.3	8.3**
VII-Imitation	2.7	0.5	2.9	0.3	2.8	0.5	4.2*
VII-Obstacle	2.8	0.4	2.9	0.4	2.8	0.4	2.7
VII-Total	19.8	2.9	22.4	2.1	21.1	2.9	27.3**
VIII-A	11.7	2.6	13.6	0.9	12.6	2.2	24.6**
IX-A	3.9	0.3	4.0	0.2	3.9	0.3	0.1
IX-B-Right	1.0	0.5	1.0	0.5	1.0	0.5	0
IX-B-Left	1.0	0.6	1.0	0.5	1.0	0.5	.6
IX-C-1st Right	1.4	0.5	1.3	0.6	1.3	0.6	.7
IX-C-1st Left	1.3	0.8	1.3	0.7	1.3	0.7	.1
IX-C-2nd Right	1.4	0.7	1.5	0.7	1.4	0.7	1.1
IX-C-2nd Left	1.5	0.6	1.3	0.6	1.4	0.6	2.8
IX-D-Ipsi	3.0	1.3	3.5	1.3	3.3	1.3	3.5
IX-D-Contra	8.2	1.8	8.7	1.6	8.4	1.7	2.4
IX-E-Total	5.7	1.4	6.5	1.4	6.1	1.5	8.8**
IX-F-Left	19.2	7.2	16.0	5.5	17.6	6.6	6.1*
IX-F-Right	16.9	6.0	13.5	4.7	15.2	5.6	9.6**
IX-F-Total	36.1	10.8	29.6	7.8	32.8	10.0	11.9**
IX-G-A	590.5	219.7	553.4	235.5	571.9	228.5	.6
IX-G-B	463.8	216.0	413.5	212.6	438.7	215.8	1.3
IX-G-Diff.	126.7	195.4	139.8	200.4	133.3	198.0	.1

* Significant at .05

** Significant at .01

Table 18

Comparison of Experimental and Control Groups on Standard and C-M Tests

Grade 2 - N = 99

	Experimental		Control		Total		
Test	Mean	S.D.	Mean	S.D.	Mean	S.D.	F
Frostig I	9.0	1.8	10.1	1.5	9.6	1.7	10.5**
Frostig II	8.9	1.6	10.1	1.0	9.5	1.5	17.9**
Frostig III	7.8	2.2	9.6	1.6	8.7	2.1	20.7**
Frostig IV	8.9	1.5	9.9	1.4	9.4	1.5	11.1**
Frostig V	9.6	1.1	10.1	0.9	9.9	1.0	6.1*
Raven %ile	52.7	29.5	72.6	26.2	62.7	29.6	12.2**
ITPA-Vis.Dec.	16.2	2.7	16.8	2.1	16.5	2.4	1.8
ITPA-Mot.Enc.	15.9	3.6	17.1	2.8	16.5	3.3	4.0*
ITPA-Voc.Enc.	19.6	7.5	21.9	5.2	20.8	6.5	3.2
Bender	0.7	1.3	-0.2	0.6	0.2	1.1	18.4**
I-A	14.8	3.4	16.3	3.4	15.5	3.5	4.6*
I-B	19.8	4.3	22.9	2.0	21.4	3.7	21.2**
I-C	11.3	1.0	11.4	1.6	11.4	1.3	0.1
I-D	8.2	1.1	8.7	1.1	8.5	1.2	5.4*
I-E	13.3	2.8	15.6	2.9	14.5	3.1	15.7**
I-F	58.2	19.0	89.0	32.0	73.8	30.5	32.9**
II-A	20.9	4.8	23.0	3.3	22.0	4.2	5.8*
II-B	20.2	4.7	24.2	3.2	22.3	4.5	23.8**
III-A	15.4	1.9	17.1	2.0	16.3	2.2	17.7**
III-B-%	42.2	20.0	52.4	19.4	47.3	20.3	6.6*
III-C	17.3	6.7	18.9	7.3	18.1	7.0	1.4
III-D	9.7	2.6	10.2	2.6	9.9	2.6	.8
III-E	5.9	1.4	6.5	0.8	6.2	1.2	7.4**
IV-A	19.5	4.4	23.4	3.8	21.5	4.5	21.5**
IV-B	16.0	1.3	17.0	1.1	16.5	1.3	16.7**
IV-C	2.8	2.7	4.6	2.2	3.7	2.6	12.4**
IV-D	13.6	1.2	14.3	0.9	13.9	1.1	10.1**
IV-E	4.9	0.3	5.0	0.1	4.9	0.3	2.8
IV-F	8.8	1.2	9.3	1.1	9.0	1.2	3.9
V-A-Method	1.8	0.6	2.1	0.6	2.0	0.6	10.4**
V-A-Time	-0.0	0.9	-0.4	0.9	-0.2	0.9	3.4
V-B-%	85.4	17.3	95.3	9.6	90.4	14.8	12.4**
V-C	20.2	4.3	23.8	5.3	22.0	5.2	13.6**
V-D	15.3	2.7	16.8	2.0	16.0	2.5	10.2**
V-E	10.8	1.6	12.0	1.6	11.3	1.8	18.8**
VI-A-Total	8.8	1.5	9.8	1.5	9.3	1.6	11.8**
VI-B-Total	3.1	0.9	3.7	1.2	3.4	1.1	8.5**

Table 18 - page 2

Comparison of Experimental and Control Groups on
Standard and C-M Tests

Grade 2 - N = 99

Test	Experimental Mean	Experimental S.D.	Control Mean	Control S.D.	Total Mean	Total S.D.	F
VII-Forward	1.0	0.2	1.0	0.0	1.0	0.1	2.0
VII-Backward	0.9	0.3	0.9	0.3	0.9	0.3	0.1
VII-Sidewise	0.9	0.3	1.0	0.1	0.9	0.2	1.0
VII-Jumping	6.0	1.9	6.8	1.4	6.4	1.7	5.8*
VII-Identification	7.9	1.5	7.9	1.8	7.9	1.6	0
VII-Imitation	2.9	0.4	2.9	0.4	2.9	0.4	1.2
VII-Obstacle	2.8	0.4	2.9	0.2	2.9	0.4	0.9
VII-Total	22.4	3.2	23.5	2.4	22.9	2.9	3.8
VIII-A	13.1	1.5	13.6	1.6	13.4	1.6	1.9
IX-A	4.0	0.2	4.0	0.1	4.0	0.2	0.0
IX-B-Right	1.0	0.6	0.9	0.4	0.9	0.5	1.2
IX-B-Left	1.0	0.6	0.8	0.4	0.9	0.5	1.7
IX-C-1st Right	1.2	0.6	1.0	0.6	1.1	0.6	1.7
IX-C-1st Left	1.1	0.5	1.0	0.5	1.1	0.5	.4
IX-C-2nd Right	1.4	0.6	1.2	0.6	1.3	0.6	3.8
IX-C-2nd Left	1.4	0.6	1.4	0.7	1.4	0.6	.1
IX-D-Ipsi	3.7	0.8	3.6	0.8	3.7	0.8	0
IX-D-Contra	9.3	1.1	9.6	0.8	9.4	1.0	2.3
IX-E-Total	6.5	1.6	7.0	1.5	6.7	1.5	2.4
IX-F-Left	16.5	7.2	13.7	4.8	15.1	6.3	5.0*
IX-F-Right	14.8	8.2	13.7	5.3	14.3	6.9	.5
IX-F-Total	31.3	14.1	27.4	7.4	29.3	11.4	2.8
IX-G-A	490.6	186.2	465.7	189.0	478.0	188.0	.4
IX-G-B	396.1	195.2	325.8	164.9	360.6	183.9	3.6
IX-G-Diff.	94.5	147.3	139.9	193.0	117.4	173.4	1.6

* Significant at .05

** Significant at .01

Table 19

Comparison of Experimental and Control Groups on Standard and C-M Tests

Grade 3 - N = 99

	Experimental		Control		Total		
Test	Mean	S.D.	Mean	S.D.	Mean	S.D.	F
Frostig I	8.3	1.4	9.1	1.0	8.7	1.3	11.6**
Frostig II	8.7	1.2	9.0	1.1	8.9	1.2	1.0
Frostig III	7.8	1.8	8.5	1.4	8.1	1.6	5.0*
Frostig IV	8.1	1.6	8.8	1.2	8.4	1.4	6.2*
Frostig V	9.0	1.0	9.7	0.6	9.4	0.9	15.1**
Raven %ile	45.6	27.2	59.2	29.4	52.5	29.1	5.8*
ITPA-Vis.Dec.	17.1	1.8	17.4	1.9	17.3	1.8	.6
ITPA-Mot.Enc.	16.8	3.3	17.6	2.8	17.2	3.1	1.7
ITPA-Voc.Enc.	20.7	5.7	21.7	4.3	21.2	5.0	1.0
Bender	1.3	1.5	0.5	1.0	0.9	1.3	7.3**
I-A	16.1	3.7	16.6	3.9	16.4	3.8	.4
I-B	22.5	2.7	23.9	1.4	23.2	2.3	10.0**
I-C	11.6	0.9	11.8	0.5	11.7	0.7	2.9
I-D	8.3	1.3	8.8	1.1	8.5	1.2	3.2
I-E	15.0	2.7	17.4	1.6	16.2	2.5	30.3**
I-F	85.6	34.2	125.6	40.5	105.8	42.5	28.6**
II-A	21.5	4.7	23.4	3.7	22.5	4.3	5.3*
II-B	20.5	4.3	24.5	3.2	22.5	4.3	28.6**
III-A	16.6	2.9	17.1	2.4	16.8	2.7	1.0
III-B-%	43.6	17.6	48.1	18.2	45.9	18.0	1.5
III-C	25.3	5.8	25.9	6.8	25.6	6.3	.2
III-D	11.0	3.1	12.0	3.6	11.5	3.4	2.0
III-E	6.1	1.3	6.5	0.8	6.3	1.1	2.7
IV-A	22.9	3.8	25.4	2.9	24.2	3.6	13.7**
IV-B	16.4	1.6	17.3	0.8	16.9	1.3	10.9**
IV-C	4.2	2.4	4.6	2.2	4.4	2.3	.9
IV-D	13.7	1.6	14.1	1.2	13.9	1.4	2.8
IV-E	4.9	0.2	5.0	0.1	5.0	0.2	0.4
IV-F	9.6	1.2	9.6	1.1	9.6	1.2	0
V-A-Method	1.9	0.6	2.4	0.5	2.1	0.6	1.0
V-A-Time	0.5	1.1	-0.1	0.9	0.2	1.0	8.7**
V-B-%	92.9	11.5	97.2	5.4	95.0	9.2	5.5*
V-C	24.4	6.1	24.7	5.1	24.6	5.6	.1
V-D	16.4	2.3	17.6	1.9	17.0	2.2	7.7**
V-E	11.4	1.7	12.6	1.5	12.0	1.7	12.4**
VI-A-Total	9.2	1.3	10.4	1.2	9.8	1.4	21.4**
VI-B-Total	2.9	1.1	3.7	1.1	3.3	1.2	11.6**

Table 19 - page 2

Comparison of Experimental and Control Groups on Standard and C-M Tests

Grade 3 - N = 99

	Experimental		Control		Total		
Test	Mean	S.D.	Mean	S.D.	Mean	S.D.	F
VII-Forward	1.0	0.1	1.0	0.0	1.0	0.1	1.0
VII-Backward	0.9	0.3	1.0	0.2	0.9	0.3	3.1
VII-Sidewise	0.9	0.2	0.9	0.2	0.9	0.2	0.0
VII-Jumping	6.7	1.5	7.0	1.2	6.9	1.4	1.2
VII-Identification	7.6	1.8	8.5	0.8	8.0	1.4	9.4**
VII-Imitation	3.0	0.3	3.0	0.3	3.0	0.3	0.0
VII-Obstacle	2.8	0.5	2.8	0.5	2.8	0.5	0.0
VII-Total	22.9	2.9	24.2	1.8	23.6	2.5	7.4**
VIII-A	13.3	1.4	14.2	1.0	13.7	1.3	10.7**
IX-A	4.0	0.0	3.9	0.3	4.0	0.2	1.9
IX-B-Right	1.0	0.6	0.9	0.5	1.0	0.6	.1
IX-B-Left	0.8	0.4	0.8	0.4	0.8	0.4	.3
IX-C-1st Right	1.1	0.6	1.1	0.6	1.1	0.6	.1
IX-C-1st Left	1.1	0.5	1.1	0.7	1.1	0.6	.2
IX-C-2nd Right	1.3	0.6	1.2	0.6	1.3	0.6	.9
IX-C-2nd Left	1.2	0.6	1.2	0.5	1.2	0.6	0
IX-D-Ipsi	3.4	1.1	3.8	0.6	3.6	0.9	6.2*
IX-D-Contra	9.2	1.1	9.7	0.6	9.4	0.9	6.7*
IX-E-Total	6.6	1.5	7.3	1.4	7.0	1.5	7.2**
IX-F-Left	14.0	5.0	12.5	4.0	13.2	4.6	2.6
IX-F-Right	13.0	5.6	11.3	4.0	12.1	4.9	2.8
IX-F-Total	27.0	9.0	23.8	7.0	25.4	8.2	3.6
IX-G-A	424.4	155.2	443.5	183.0	434.1	170.1	.3
IX-G-B	317.1	163.6	324.4	170.9	320.8	167.4	0
IX-G-Diff.	107.3	135.1	119.1	181.1	113.3	160.1	.1

* Significant at .05

** Significant at .01

Table 20

Comparison of Experimental and Control Groups on Standard and C-M Tests

Grade 5 - N = 100

Test	Experimental		Control		Total		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	F
Frostig I	8.8	1.5	9.4	1.0	9.1	1.3	5.4*
Frostig II	8.9	1.5	9.2	1.2	9.1	1.3	.6
Frostig III	7.5	1.2	8.2	1.1	7.8	1.2	8.0**
Frostig IV	8.0	1.9	9.0	1.5	8.5	1.8	8.4**
Frostig V	9.0	1.6	9.2	1.3	9.1	1.5	.5
Raven %ile	45.0	27.1	59.0	27.3	52.0	28.1	6.4*
ITPA-Vis.Dec.	19.1	2.1	19.1	1.6	19.1	1.9	0
ITPA-Mot.Enc.	19.2	3.5	20.2	3.2	19.7	3.4	2.4
ITPA-Voc.Enc.	24.0	6.8	26.4	6.5	25.2	6.8	3.3
Bender	0.9	1.5	0.1	0.8	0.5	1.3	15.1**
I-A	18.0	2.9	18.9	2.6	18.5	2.8	2.4
I-B	24.2	1.6	24.6	0.8	24.4	1.3	2.9
I-C	11.6	1.8	11.9	0.4	11.7	1.3	1.5
I-D	9.1	0.8	9.3	0.7	9.2	0.8	1.4
I-E	18.0	1.8	19.1	1.0	18.5	1.6	13.0**
I-F	123.9	49.7	155.5	53.7	139.7	54.1	9.4**
II-A	23.8	4.2	25.6	3.4	24.7	3.9	5.4*
II-B	23.9	3.4	26.3	2.0	25.1	3.0	18.0**
III-A	17.6	2.6	18.3	2.6	18.0	2.6	1.8
III-B-%	18.3	11.7	27.2	11.6	22.8	12.5	14.1
III-C	35.6	6.8	37.4	6.4	36.5	6.7	2.0
III-D	10.4	2.9	12.0	3.3	11.2	3.2	5.8*
III-E	6.6	0.8	6.9	0.3	6.8	0.7	4.8*
IV-A	26.0	2.2	28.4	1.5	27.2	2.2	42.4**
IV-B	17.4	0.8	17.3	0.9	17.4	0.8	.8
IV-C	4.8	1.7	5.2	1.4	5.0	1.6	1.6
IV-D	14.4	1.0	15.0	0.8	14.7	1.0	11.1**
IV-E	4.9	0.2	5.0	0.1	5.0	0.2	0.3
IV-F	10.2	1.1	10.5	1.1	10.4	1.1	1.2
V-A-Method	2.3	0.6	2.5	0.6	2.4	0.6	4.1*
V-A-Time	-0.1	0.9	-0.3	0.9	-0.2	0.9	1.0
V-B-%	94.4	5.9	96.3	4.8	95.3	5.5	2.9
V-C	27.0	6.5	28.1	5.8	27.6	6.2	.9
V-D	17.7	2.0	19.0	1.1	18.3	1.7	15.5**
V-E	12.8	1.4	13.3	1.1	13.1	1.3	3.3
VI-A-Total	11.0	2.0	12.2	1.8	11.6	2.0	9.4**
VI-B-Total	4.1	1.1	4.6	1.0	4.3	1.1	5.0*

Table 20 - page 2

Comparison of Experimental and Control Groups on
Standard and C-M Tests

Grade 5 - N = 100

	Experimental		Control		Total		
Test	Mean	S.D.	Mean	S.D.	Mean	S.D.	F
VII-Forward	1.0	0.0	1.0	0.0	1.0	0.0	0.0
VII-Backward	0.9	0.3	0.9	0.3	0.9	0.3	0.2
VII-Sidewise	1.0	0.1	1.0	0.1	1.0	0.1	0.0
VII-Jumping	7.0	1.7	7.5	0.8	7.3	1.3	4.4*
VII-Identification	8.1	1.8	8.8	0.6	8.4	1.4	5.8*
VII-Imitation	3.0	0.3	3.1	0.6	3.1	0.4	0.3
VII-Obstacle	2.8	0.5	2.9	0.4	2.9	0.5	0.0
VII-Total	23.8	3.5	25.1	1.4	24.5	2.7	6.0*
VIII-A	14.4	0.8	14.6	0.7	14.5	0.8	2.6
IX-A	4.0	0.0	4.0	0.2	4.0	0.1	2.0
IX-B-Right	0.9	0.5	0.8	0.5	0.8	0.5	.5
IX-B-Left	0.8	0.6	0.7	0.5	0.8	0.6	.6
IX-C-1st Right	0.9	0.5	1.0	0.5	1.0	0.5	0
IX-C-1st Left	0.9	0.6	0.9	0.5	0.9	0.6	.2
IX-C-2nd Right	1.0	0.6	1.0	0.5	1.0	0.6	.2
IX-C-2nd Left	1.1	0.7	1.1	0.5	1.1	0.6	.1
IX-D-Ipsi	3.8	0.5	4.0	0.1	3.9	0.4	5.0*
IX-D-Contra	9.6	0.9	9.8	0.4	9.7	0.7	4.5*
IX-E-Total	7.2	1.4	7.9	1.2	7.5	1.4	7.0**
IX-F-Left	12.3	5.3	11.6	5.1	12.0	5.2	.4
IX-F-Right	11.1	4.9	9.9	3.4	10.5	4.3	2.1
IX-F-Total	23.4	8.5	21.5	7.3	22.5	8.0	1.4
IX-G-A	339.4	185.2	321.0	137.7	330.2	163.4	.3
IX-G-B	252.4	140.4	233.4	117.5	242.9	129.8	.5
IX-G-Diff.	86.6	160.8	87.6	118,6	87.1	141.3	0

* Significant at .05

** Significant at .01

Table 21

Intercorrelations of Cognitive-Motor and Standardized Tests and Total Dysfunction Score

TEST	r
VISUAL PERCEPTION	
Frostig 2	-.158
Frostig 3	-.536**
Frostig 4	-.418**
Frostig 5	-.245*
I-A	-.265**
I-B	-.429**
I-D	-.214*
I-E	-.285**
I-F	-.395**
AUDITORY PERCEPTION	
II-A	-.317**
II-B	-.481**
MEMORY	
III-A	-.295**
III-B	-.278**
III-C	-.110
III-E	-.302**
ORIENTATION	
IV-A	-.362**
IV-B	-.371**
IV-C	-.235*
IV-D	-.281**
IV-F	-.135
INTEGRATION	
V-A (Time)	-.304**
V-B	-.146
V-C	-.244*
V-D	-.453**
V-E	-.300**
Raven	-.417**

TEST	r
FINE MOTOR - Eye-Hand	
Frostig 1	-.261**
VI-A	-.462**
VI-B	-.399**
Bender	+.393**
GROSS MOTOR	
VII-Jumping	-.276**
VII-Ident.	-.305**
TACTILE-KINESTHETIC	
IX-D	-.146
IX-E	-.227*
IX-F	+.244*
LINGUISTICS	
ITPA (Vis. Dec.)	-.174
ITPA (Mot. Enc.)	-.060
VIII-A	-.381**

Note: Underlined items comprise refined cognitive-motor battery.

* Significant at .05

** Significant at .01

APPENDIX D

Normative Data

NORMATIVE DATA

GRADE NORMS DATA

In the original study, group comparisons between Experimental and Control groups were made according to grade. The means and standard deviations for each test by grade are reported in full in Tables 17, 18, 19 and 20. Those tests that significantly differentiated between the two groups are presented here. In addition, the cut off score used to determine high cognitive-motor dysfunction is given in the last column.

AGE NORMS DATA

Age norms for children between the ages of six years two months and nine years seven months for each six month interval are provided for use when individual children are examined. In this way, a subject's performance may be compared on each test with the expected performance for his total age group. Used in this way, a score that falls one standard deviation below the mean for the total group may be considered indicative of significant dysfunction. In addition, a subject's scores may be compared to the scores obtained by children from the original experimental group (behaviorally maladjusted) as well as those from the control group (problem free).

SPECIAL INSTRUCTIONS

In order to make sure of test score equivalence across age groups, where different forms were used, special scoring instructions were required. These are indicated on the age norms by Footnotes 1 through 4. The explanation of these conversions is as follows:

FOOTNOTE 1: Bender Standard: This score is obtained by using the Koppitz Scoring Method to determine the raw score:

$$\text{Bender Standard Score} = \frac{\text{Raw Score - Age Group Mean}}{\text{Age Group S.D.}}$$

FOOTNOTE 2: III-B Proportion Score:

$$\text{III-B Proportion Score} = \frac{\text{Raw Score}}{\text{Maximum Score for Paragraph Used}}$$

FOOTNOTE 3: V-A Normalized Score:

$$\text{V-A Score} = \frac{\text{Raw Score - Age Group Mean}}{\text{Age Group S.D.}}$$

FOOTNOTE 4: V-B Proportion Score:

$$\text{V-B Proportion Score} = \frac{\text{Raw Score}}{\text{Maximum No. for Form Used}}$$

LAFAYETTE CLINIC
Cognitive-Perceptual-Motor Research

NORMATIVE DATA
Lafayette Clinic Cognitive-Motor Battery

TEST NAME	Grade 1 6/2 - 8/4			Grade 2 7/3 - 9/7			Grade 3 8/1 - 10/11			Grade 5 10/0 - 12/3		
	M	S	C	M	S	C	M	S	C	M	S	C
Frostig I	10.5	2.3	<7.9	9.6	1.7	<7.90	8.7	1.3	<7.9	9.1	1.3	<7.99
Frostig II	10.0	1.8	7.9	9.5	1.5	7.90	8.9	1.2		9.1	1.3	
Frostig III	9.2	2.7	7.9	8.7	2.1	7.9	8.1	1.6	<7.9	7.8	1.2	6.99
Frostig IV	10.6	1.9	7.9	9.4	1.5	7.9	8.4	1.4	<7.9	8.5	1.8	6.99
Frostig V	11.1	1.3		9.9	1.0	7.9	9.4	0.9	7.9	9.1	1.5	
Bender	6.9	3.7	>12.0	4.5	2.8	>8.0	4.5	2.9	>7.0	2.5	2.5	>5.0
Raven	17.8	4.2		21.0	4.8		21.5	4.4		26.1	4.3	
ITPA-Vis.Dec.	14.9	2.5	11.9	16.5	2.4		17.3	1.8		19.1	1.9	<16.9
ITPA-Motor	14.6	3.6	10.9	16.5	3.3	12.9	17.3	3.1		19.7	3.4	
I-A-Vis.Perc.-Form.	13.85	4.15	9.99	15.5	3.5	10.9	16.4	3.8		18.5	2.8	
I-B-Vis. Disc.	17.8	5.5	10.99	21.4	3.7	17.9	23.2	2.2	20.9	24.4	1.3	23.9
I-D-Vis.Perc.-Const.	8.1	1.6	6.99	8.5	1.2	6.9	8.5	1.2		9.2	.7	
I-E-Vis.Perc.-Const.	10.1	3.7	5.99	14.5	3.1	9.9	16.2	2.5	12.9	18.5	1.6	16.9
I-F-Vis.Perc.-Const.	35.1	22.7		73.8	30.5		105.8	42.5		139.7	54.1	
II-A-Sound Disc.	19.9	5.1	13.99	21.9	4.2	16.9	22.5	4.3	15.9	24.7	3.9	20.9
II-B-Aud. Perc.	17.5	4.8	12.99	22.3	4.5	16.9	22.5	4.3	16.9	25.1	3.0	21.9
III-A-Memory-Visual	13.7	2.9	10.99	16.2	2.2	13.9	16.8	2.7		18.0	2.6	
III-B-Mem.-Immed.Mem.	8.6	4.4		9.9	4.3	5.9	9.2	3.6		8.6	4.7	3.9
III-C-Mem.-Immed.Mem.	12.4	8.5	3.99	18.1	7.0		25.6	6.3		36.5	6.7	
III-E-Mem.Del.	6.3	1.0	4.99	6.2	1.2	4.9	6.3	1.1		6.9	1.1	

M - Mean S - Standard Deviation C - Cutting Score

NORMATIVE DATA - Lafayette Clinic Cognitive-Motor Battery
Page 2.

TEST NAME	Grade 1 6/2 - 8/4			Grade 2 7/3 - 9/7			Grade 3 8/1 - 10/11			Grade 5 10/0 - 12/3		
	M	S	C	M	S	C	M	S	C	M	S	C
IV-A-Orientation-Time	16.3	4.5	11.99	21.4	4.5	16.9	24.2	3.6	20.9	27.2	2.2	24.9
IV-B-Orientation-Size	15.4	1.8	12.99	16.5	1.3	14.9	16.9	1.3	15.9	17.4	.8	
IV-C-Orientation-Mid.	2.8	2.7		3.7	2.6	2.9	4.4	2.3		5.0	1.6	
IV-D-Orientation-Space	12.9	1.8	10.99	13.9	1.1	12.9	13.9	1.4		14.7	1.0	13.9
IV-F-Orientation-Space	8.5	1.1		9.0	1.2		9.6	1.2		10.4	1.1	
V-A-Integ.-Non-Verb.	235.0	94.4		201.9	80.7		286.8	136.8	500.0	226.5	123.0	
V-B-Integ.-Symbolic	1.9	.72		10.8	1.8	9.9	11.4	1.1	9.9	15.3	.9	
V-C-Integ.-Symbol(Abs)	19.1	5.1	13.99	22.0	5.2	16.9	24.6	5.6		27.6	6.2	
V-D-Integ.-Inf.Rsng.	13.6	2.9	10.99	16.0	2.4	12.9	16.9	2.2	13.9	18.3	1.7	16.9
V-E-Integ.-Symb(Nos.)	10.5	1.9	8.99	11.3	1.8	8.9	12.0	1.7	9.9	13.1	1.3	
VI-A-Fine Motor Cont.	9.2	1.8	7.99	9.3	1.6	7.9	9.8	1.4	7.9	11.6	2.0	9.9
VI-B-Eye-Hand Coord.	3.1	1.2		3.4	1.1	2.9	3.3	1.2	2.9	4.3	1.1	2.9
VII-Gross Mot.Co-Jump	5.3	1.9		6.4	1.7	4.9	6.9	1.4		7.3	1.3	
VII-Gross Mot.Co-Iden.	7.6	1.3		7.9	1.6		8.0	1.4		8.4	1.4	
VIII-A-Ling.Input	12.6	2.2	9.99	13.4	1.6		13.7	1.3	11.9	14.5	.8	
IX-D-Face-Hand(Total)	8.4	1.7		9.4	1.0		9.4	.9	7.9	9.7	.7	
IX-E-Tact.Mov.Stimulis	6.1	1.5	4.99	6.7	1.5		6.9	1.5	4.9	7.5	1.4	6.9
IX-F-Kin.M.M.(Left)	17.6	6.6		15.1	6.3	21.0	13.2	4.6		12.0	5.2	
IX-F-Kin.M.M.(Right)	32.8	9.9	45.0	14.3	6.9		12.1	4.9		10.5	4.3	
IX-F-Kin.M.M.(Total)	32.8	10.0		29.3	11.4		25.4	8.2		22.5	8.0	

M - Mean   S - Standard Deviation   C - Cutting Score

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 6 yrs/2 mos - 6 yrs/7 mos

ITEM	EXPERIMENTAL N=25 Mean	EXPERIMENTAL N=25 S.D.	CONTROL N=13 Mean	CONTROL N=13 S.D.	TOTAL N=38 Mean	TOTAL N=38 S.D.
Frostig I	10.6	2.3	11.5	2.1	10.9	2.3
Frostig II	10.0	1.8	10.6	1.5	10.2	1.7
Frostig III	8.0	2.2	10.8	2.4	9.0	2.6
Frostig IV	10.2	1.7	12.5	1.6	11.0	2.0
Frostig V	11.0	1.4	12.3	1.1	11.4	1.4
ITPA-Vis. Dec.	13.8	2.5	15.5	2.3	14.4	2.6
ITPA-Mot.Enc.	13.8	3.9	14.8	2.5	14.2	3.5
ITPA-Voc.Enc.	16.7	4.4	18.8	6.1	17.4	5.1
Raven Percentile	56.6	30.5	75.4	22.9	63.0	29.5
Bender Standard[1]	.5	.9	.1	.8	.3	.9
I-A-Vis.Perc.-Form	12.1	4.2	16.0	3.1	13.4	4.2
I-B-Vis.Disc.	14.2	4.9	21.5	3.1	16.7	5.6
I-C -Vis.Percep.-Space	11.0	1.3	11.8	.5	11.3	1.2
I-D-Vis.Perc.-Const.	7.8	1.6	8.8	.9	8.1	1.5
I-E-Vis.Perc.-Const.	8.4	2.6	11.9	4.0	9.6	3.6
I-F-Vis.Perc.-Const.	21.1	14.2	43.0	8.7	28.6	16.4
II-A-Sound Disc.	18.3	4.7	22.0	4.7	19.6	5.0
II-B-Aud.Perc.	14.7	4.4	21.2	3.4	16.9	5.1
III-A-Memory-Visual	13.4	3.1	14.8	1.2	13.9	2.7
III-B-Mem.-Immed.Mem.%[2]	37.1	21.6	44.7	16.6	39.7	20.4
III-C-Mem.-Immed.Mem.	9.4	6.1	14.1	8.6	11.0	7.4
III-D-Mem.-Immed.Meaning	8.0	2.4	9.2	3.0	8.4	2.7
III-E-Mem.Del.	5.7	1.4	6.6	.6	6.0	1.2
IV-A-Orientation-Time	13.9	3.5	18.8	5.1	15.6	4.7
IV-B-Orientation-Size	14.2	2.2	15.5	.7	14.6	2.0
IV-C-Orientation-Mid.	2.1	2.8	3.1	2.7	2.4	2.8
IV-D-Orientation-Space	12.3	2.0	13.4	1.1	12.6	1.8
IV-E-Orientation-Size	4.8	.4	4.7	.6	4.8	.5
IV-F-Orientation-Space	8.2	1.0	9.0	.7	8.5	1.0

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 6 yrs/2 mos - 6 yrs/7 mos
Page 2.

	EXPERIMENTAL N=25		CONTROL N=13		TOTAL N=38	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
*V-A-Norm.Score^3(time)	.7	1.3	.2	.7	.36	1.2
V-A-Method	1.7	.7	2.2	.7	1.8	.7
*V-B-%Score^4(total)	65.3	21.6	80.8	15.8	70.6	21.1
*V-C-Integ.-Symb.(Abs.)	17.1	4.4	20.4	3.4	18.2	4.4
**V-D-Integ.-Inf.Rsng.	11.8	2.9	15.1	2.5	12.9	3.2
V-E-Integ.-Symb.(Nos.)	9.6	2.0	10.6	1.4	10.0	1.9
*VI-A-Fine Mot.Cont.(total)	8.2	1.8	9.5	.9	8.7	1.6
VI-B-Eye-Hand Coord.(total)	2.7	.8	2.8	1.2	2.7	1.0
VII-Gr.Mot.Co.-Forward	1.0	0	1.0	0	1.0	0
VII-Gr.Mot.Co.-Backward	.5	.5	.8	.4	.6	.5
VII-Gr.Mot.Co.-Sidewise	.8	.4	1.0	.3	.9	.3
VII-Gr.Mot.Co.-Jumping	5.0	1.8	4.8	1.7	4.9	1.8
VII-Gr.Mot.Co.-Identif.	7.3	1.3	7.8	1.1	7.4	1.3
*VII-Gr.Mot.Co.-Imitation	2.6	.6	3.0	0	2.8	.5
VII-Gr.Mot.Co.-Obst.C.	2.8	.4	2.9	.5	2.9	.4
VII-Gr.Mot.Co.-Total score	20.1	3.0	21.2	2.4	20.5	2.8
**VIII-A-Ling.Input-Total sc.	11.4	2.7	13.8	.8	12.2	2.5
IX-A-Tactile-Man.Perc.-Total	4.0	0	4.0	0	4.0	0
IX-B-Tactile-Loc.of St.-Rt.	1.0	.4	1.2	.6	1.1	.5
IX-B-Tactile-Loc.of St.-Left	1.1	.6	.9	.5	1.0	.6
IX-C-Tact.-2pt.Disc.-1st Rt.	1.4	.5	1.4	.5	1.4	.5
IX-C-Tact.-2pt.Disc.-1st Lf.	1.2	.7	1.5	.8	1.3	.7
IX-C-Tact.-2pt.Disc.-2nd Rt.	1.4	.7	1.6	.6	1.5	.7
IX-C-Tact.-2pt.Disc.-2ndLf.	1.4	.6	1.2	.8	1.4	.7
IX-D-Face-Hand-Ipsi(4scores)	3.0	1.2	3.2	.8	3.0	1.1
IX-D-Face-Hand - Total score	8.4	1.7	8.5	1.1	8.4	1.5
IX-E-Tact.Mov.Stim.-Total sc.	5.7	1.4	6.2	1.4	5.9	1.4
IX-F-Kin.M.M.(Left)	20.0	8.5	17.5	5.4	19.2	7.7
IX-F-Kin.M.M.(Right)	16.1	5.6	15.3	5.4	15.8	5.5
IX-F-Kin.M.M.(Total)	36.2	11.2	32.8	8.5	35.0	10.5
IX-G-Tact.Man.Perc.Time-secs. Trial A	628.3	209.7	608.7	226.2	621.6	215.7
IX-G-Tact.Man.Perc.Time-secs. Trial B	448.6	218.0	401.0	208.0	432.3	215.8
IX-G-Tact.Man.Perc.-Diff.A-B	179.7	232.8	207.7	230.3	189.3	232.3

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 6 yrs/2 mos - 6 yrs/7 mos
Page 3.

	EXPERIMENTAL N=25		CONTROL N=13		TOTAL N=38	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
X-Know.of L&R-Dom.	2.2	.9	2.7	.7	2.3	.9
X-Hand Pref.-Dom.	1.7	.9	1.8	.9	1.7	.9
X-Eye Dominance	1.6	.8	1.5	.7	1.5	.8
X-Foot Dominance	2.1	1.0	1.9	1.0	2.0	1.0

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 6 yrs/8 mos - 7 yrs/1 mo

ITEM	EXPERIMENTAL N=19 Mean	EXPERIMENTAL N=19 S.D.	CONTROL N=23 Mean	CONTROL N=23 S.D.	TOTAL N=42 Mean	TOTAL N=42 S.D.
*Frostig I	9.2	1.8	11.6	2.4	10.5	2.5
*Frostig II	9.4	2.1	10.8	1.5	10.2	1.9
*Frostig III	8.1	2.1	10.5	2.1	9.4	2.4
Frostig IV	10.0	2.2	11.0	1.6	10.6	2.0
*Frostig V	10.6	1.3	11.5	1.1	11.1	1.3
ITPA-Vis. Dec.	15.0	2.6	15.4	2.3	15.2	2.5
ITPA-Mot. Enc.	13.6	2.8	15.2	3.8	14.5	3.5
ITPA-Voc. Enc.	17.2	4.7	20.3	5.6	18.9	5.4
*Raven Percentile	47.1	24.2	68.5	25.8	58.8	27.3
*Bender Standard[1]	.5	.8	.2	.9	.1	.9
I-A-Vis.Perc.-Form	13.4	4.4	15.2	3.7	14.4	4.1
*I-B-Vis.Disc.	15.5	5.8	20.5	4.5	18.2	5.7
*I-C-Vis.Perc.-Space-total sc.	10.7	1.6	11.7	.5	11.3	1.3
I-D-Vis.Perc.-Const.-raw sc.	7.5	1.6	8.4	1.4	8.0	1.6
*I-E-Vis.Perc.-Const.-raw sc.	9.3	3.5	12.2	3.3	10.8	3.7
I-F-Vis.Perc.-Const.	33.8	24.8	43.3	15.7	39.0	20.9
II-A-Sound Disc.	19.0	5.8	20.6	4.9	19.9	5.4
*II-B-Aud.Perc.	15.4	4.3	19.6	3.6	17.7	4.4
*III-A-Memory-Visual	12.5	3.3	14.3	2.2	13.5	2.9
III-B-Mem.-Immed.Mem.%[2]	36.8	23.0	46.0	17.5	41.8	20.7
III-C-Mem.-Immed.Mem.	10.6	7.8	15.0	10.4	13.0	9.6
III-D-Mem.-Immed.Meaning	8.0	2.8	9.1	2.5	8.6	2.7
III-E-Mem.Del.	6.4	.9	6.7	.6	6.6	.8
*IV-A-Orientation-Time	14.7	3.5	19.4	3.9	17.3	4.4
IV-B-Orientation-Size	15.5	1.6	16.2	1.3	15.9	1.5
IV-C-Orientation-Mid.	2.5	2.6	3.3	2.8	3.0	2.7
IV-D-Orientation-Space	12.5	2.0	13.4	1.7	13.0	1.9
IV-E-Orientation-Size	4.8	.4	4.8	.5	4.8	.4
IV-F-Orientation-Space	8.2	1.1	8.7	1.0	8.5	1.1

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 6 yrs/8 mos - 7 yrs/1 mo

Page 2.

	EXPERIMENTAL N=19		CONTROL N-23		TOTAL N-42	
ITEM	Mean	S.D.	Mean	S.D.	Mean	S.D.
V-A-Norm.Score[3] (time)	.4	.6	.0	1.1	.2	.9
V-A-Method	1.7	.6	2.0	.7	1.9	.7
V-B-% Score[4] (total)	73.7	19.0	79.0	16.5	76.6	17.8
*V-C-Integ.-Symb.(Abs.)	16.6	4.4	20.7	5.1	18.8	5.2
V-D-Integ.-Inf.Rsng.	13.2	3.1	14.8	2.1	14.1	2.7
*V-E-Integ.-Symb.(Nos.)	10.0	2.5	11.4	1.6	10.8	2.2
*VI-A-Fine Mot.Cont. (total)	8.7	1.4	10.0	1.7	9.4	1.7
VI-B-Eye-Hand Coord. (total)	2.7	1.0	3.5	1.4	3.1	1.3
VII-Gr.Mot.Coord.-Forward	.9	.3	1.0	0.0	1.0	.2
VII-Gr.Mot.Coord.-Backward	.7	.5	.8	.4	.8	.4
*VII-Gr.Mot.Coord.-Sidewise	.8	.4	1.0	0.0	.9	.3
*VII-Gr.Mot.Coord.-Jumping	4.6	2.0	6.0	1.8	5.4	2.0
**VII-Gr.Mot.Coord.-Identif.	7.3	1.1	8.3	.9	7.8	1.1
VII-Gr.Mot.Coord.-Imitation	2.7	.5	2.8	.4	2.8	.4
VII-Gr.Mot.Coord.-Obst.C.	2.7	.5	2.8	.4	2.8	.4
**VII-Gr.Mot.Coord.-Total score	19.6	2.9	22.7	1.9	22.3	2.8
*VIII-A-Ling.Input-Total score	11.8	2.7	13.5	.8	12.7	2.1
IX-A-Tactile-Man.Perc.-Total	3.8	.5	4.0	0.0	3.9	.3
IX-B-Tactile-Loc.of St.-Rt.	.9	.6	.8	.4	.9	.5
IX-B-Tactile-Loc.of St.-Left	1.0	6.0	.9	.4	1.0	.5
IX-C-Tact.-2pt.Disc.-1st Rt.	1.4	.6	1.2	.6	1.3	.6
IX-C-Tact.-2pt.Disc.-1st Left	1.4	.9	1.3	.7	1.4	.8
IX-C-Tact.-2pt.Disc.-2nd Rt.	1.1	.6	1.5	.7	1.4	.7
IX-C-Tact.-2pt.Disc.-2nd Left	1.4	.6	1.3	.5	1.4	.6
*IX-D-Face-Hand-Ipsi(4 scores)	3.0	1.4	4.1	1.1	3.6	1.3
*IX-D-Face-Hand Total score	7.7	1.9	9.0	1.6	8.4	1.8
IX-E-Tact.Mov.Stim.-Total sc.	6.0	1.3	6.8	1.5	6.4	1.4
*IX-F-Kin.M.M. (Left)	17.8	5.0	14.4	5.1	15.9	5.3
**IX-F-Kin.M.M. (Right)	17.4	6.0	12.8	3.7	14.9	5.4
**IX-F-Kin.M.M. (Total)	35.2	9.3	27.2	6.6	30.8	8.9
IX-G.Tact. Man. Perc. Time-secs.-Trial A	547.0	232.1	571.2	271.1	560.3	254.5
IX-G-Tact. Man. Perc. Time-secs.-Trial B	440.4	207.8	428.6	249.7	433.9	231.8
IX-G-Tact. Man. Perc. Diff. A - B	106.6	128.4	142.6	202.8	126.3	174.0

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 6 yrs/8 mos - 7 yrs/1 mo
Page 3.

	EXPERIMENTAL N=19		CONTROL N=23		TOTAL N=42	
ITEM	Mean	S.D.	Mean	S.D.	Mean	S.D.
X-Know. of L&R-Dom.	2.1	.8	2.6	.6	2.4	.7
X-Hand Pref.-Dom.	1.6	.9	1.7	1.0	1.7	.9
X-Eye Dominance	1.8	.8	1.6	.7	1.7	.7
X-Foot Dominance	2.5	.8	2.0	1.0	2.2	.9

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 7 yrs/2 mos - 7 yrs/7 mos

ITEM	EXPERIMENTAL N=18 Mean	EXPERIMENTAL N=18 S.D.	CONTROL N=27 Mean	CONTROL N=27 S.D.	TOTAL N=45 Mean	TOTAL N=45 S.D.
Frostig I	9.9	2.0	10.3	1.7	10.2	1.8
Frostig II	9.2	1.6	9.8	1.4	9.6	1.5
*Frostig III	7.1	2.4	10.2	2.4	9.0	2.8
Frostig IV	9.6	1.5	10.4	1.4	10.1	1.5
*Frostig V	9.7	1.0	10.7	.8	10.3	1.0
ITPA - Vis. Dec.	15.5	3.2	16.0	1.7	15.8	2.4
ITPA - Mot. Enc.	15.7	3.3	15.8	3.8	15.8	3.6
ITPA - Voc. Enc.	17.8	6.1	19.6	6.0	18.9	6.1
Raven Percentile	55.3	28.3	70.6	22.3	64.4	26.0
*Bender Standard[1]	.6	1.0	.3	.8	.1	1.0
I-A - Vis. Perc. - Form	13.2	3.7	15.0	3.6	14.2	3.7
*I-B - Vis. Disc.	18.6	4.2	21.5	3.0	20.3	3.8
I-C - Vis. Perc.-Space-tot.sc.	11.0	.9	11.1	2.3	11.1	1.8
I-D-Vis.Perc.-Const.-raw sc.	8.6	1.0	8.3	1.7	8.4	1.5
I-E-Vis.Perc.-Const.-raw sc.	11.8	3.4	12.6	4.4	12.3	4.1
I-F-Vis.Perc.-Const.	47.7	21.5	63.7	39.1	57.3	34.1
*II-A - Sound Discrim.	19.9	5.2	23.0	4.4	21.8	5.0
*II-B - Aud. Perc.	17.6	4.4	21.4	4.7	19.9	5.0
III-A - Memory-Visual	14.6	2.7	15.9	3.0	15.4	3.0
III-B-Mem.-Immed.Mem.% [2]	41.0	20.6	50.4	21.9	46.7	21.9
III-C-Mem.-Immed.Mem.	16.1	7.9	16.4	8.1	16.3	8.0
III-D-Mem.-Immed.Meaning	10.2	2.3	9.2	2.4	9.6	2.4
III-E-Mem.Del.	6.0	1.1	6.4	.8	6.2	.9
IV-A-Orientation - Time	16.9	5.0	19.0	4.8	18.2	5.0
IV-B-Orientation - Size	15.4	1.2	16.1	1.6	15.8	1.5
IV-C-Orientation - Midline	2.9	2.8	4.1	2.4	3.6	2.6
IV-D-Orientation - Space	13.2	1.0	13.6	1.1	13.4	1.0
*IV-E-Orientation - Size	4.7	.6	5.0	.2	4.9	.4
IV-F-Orientation - Space	8.6	1.3	8.6	1.2	8.6	1.3

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 7 yrs/2mos - 7 yrs/7 mos
Page 2.

ITEM	EXPERIMENTAL N=18		CONTROL N=27		TOTAL N=45	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
V-A-Norm.Score [3] (time)	.4	.8	.3	.8	-.02	.8
V-A-Method	1.4	.6	2.1	.6	1.8	.7
V-B-% Score [4] (total)	80.6	17.8	83.0	16.9	82.0	17.3
V-C-Integ.-Symb.(Abs.)	18.9	3.6	21.6	4.4	20.5	4.3
V-D-Integ.-Infer. Rsng.	14.7	2.4	14.8	2.6	14.8	2.5
V-E-Integ.-Symb.(Nos.)	10.2	1.4	11.5	1.7	11.0	1.7
VI-A-Fine Mot. Cont. (total)	8.9	1.5	9.9	1.8	9.5	1.8
VI-B-Eye-Hand Coord. (total)	3.0	.9	4.0	1.0	3.6	1.0
VII-Gr.Mot.Coord.-Forward	1.0	0.0	1.0	0.0	1.0	0.0
VII-Gr.Mot.Coord.-Backward	.8	.4	.9	.3	.8	.4
VII-Gr.Mot.Coord.-Sidewise	.9	.2	1.0	0.0	1.0	.1
VII-Gr.Mot.Coord.-Jumping	5.3	2.2	6.7	1.5	6.2	1.9
VII-Gr.Mot.Coord.-Identif.	7.5	1.7	7.8	1.2	7.7	1.5
VII-Gr.Mot.Coord.-Imitation	2.9	.2	2.9	.4	2.9	.3
VII-Gr.Mot.Coord.-Obst.C.	2.8	.5	3.0	.2	2.9	.4
VII-Gr.Mot.Coord.-Total sc.	21.3	3.7	23.3	1.9	22.5	2.9
VIII-A-Ling.Input-Total sc.	12.7	1.5	13.0	1.7	12.9	1.7
IX-A-Tactile-Man.Perc.-Total	3.9	.2	3.9	.3	3.9	.2
IX-B-Tactile-Loc.of St.-Rt.	1.0	.5	.9	.5	1.0	.5
IX-B-Tactile-Loc. of St.-Left	.9	.6	1.0	.5	1.0	.5
IX-C-Tact.-2pt.Disc.-1st Rt.	1.2	.6	1.2	.6	1.2	.6
IX-C-Tact.-2pt.Disc.-1st Left	1.0	.6	1.1	.5	1.1	.6
IX-C-Tact.-2pt.Disc.-2nd Rt.	1.4	.7	1.2	.6	1.3	.6
IX-C-Tact.-2pt.Disc.-2nd Left	1.6	.5	1.4	.4	1.4	.5
IX-D-Face-Hand-Ipsi(4 scores)	3.5	.9	3.0	1.3	3.2	1.2
IX-D-Face-Hand-Total score	9.2	1.0	8.8	1.6	9.0	1.4
IX-E-Tact.Mov.Stim.-Total sc.	6.2	1.5	6.3	1.6	6.2	1.5
IX-F-Kin.M.M. (Left)	17.6	8.1	15.6	5.3	16.4	6.6
IX-F-Kin.M.M. (Right)	17.0	10.7	14.9	5.2	15.7	7.9
IX-F-Kin.M.M. (Total)	34.6	17.8	30.5	7.5	32.2	12.9
IX-G-Tact. Man. Perc. Time-secs.-Trial A	486.4	158.3	464.9	177.6	473.5	170.5
IX-G-Tact. Man. Perc. Time-secs.-Trial B	405.8	214.3	386.7	181.9	394.3	195.7
IX-G-Tact. Man. Perc. Diff. A - B	80.7	164.0	78.2	169.4	72.2	167.2

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 7 yrs/2 mos - 7 yrs/7 mos
Page 3.

	EXPERIMENTAL N=18		CONTROL N=27		TOTAL N=45	
ITEM	Mean	S.D.	Mean	S.D.	Mean	S.D.
-Know. of L&R-Dom.	2.4	.8	2.5	.8	2.5	.8
-Hand. Pref.-Dom.	1.7	.9	1.4	.8	1.5	.8
-Eye Dominance	1.3	.6	1.7	.8	1.5	.7
-Foot Dominance	2.2	1.0	1.8	1.0	1.9	1.0

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 7 yrs/8 mos - 8 yrs/1 mo

ITEM	EXPERIMENTAL N= 18 Mean	S.D.	CONTROL N= 27 Mean	S.D.	TOTAL N= 45 Mean	S.D.
*Frostig I	8.6	1.6	10.2	1.4	9.6	1.7
*Frostig II	8.9	1.8	10.2	.9	9.7	1.5
Frostig III	8.7	2.1	9.7	1.4	9.3	1.8
*Frostig IV	8.6	1.4	9.9	1.3	9.4	1.5
Frostig V	9.9	.9	10.3	.8	10.1	.8
ITPA - Vis. Dec.	16.4	2.1	17.3	2.0	17.0	2.1
ITPA - Mot. Enc.	16.2	3.7	17.8	2.1	17.2	3.0
ITPA - Voc. Enc.	20.6	6.3	21.9	5.6	21.4	6.0
Raven Percentile	60.3	27.4	74.8	26.0	69.0	27.5
Bender Standard [1]	.2	.8	.2	.6	-.1	.7
*I-A - Vis. Perc. - Form	14.7	4.0	17.0	3.1	16.1	3.7
*I-B - Vis. Disc.	19.6	5.6	20.0	1.8	21.6	4.2
I-C -Vis.Perc.-Space-tot.sc.	11.3	1.2	11.6	.6	11.5	.9
I-D-Vis.Perc.-Const.-raw sc.	8.3	1.2	8.9	1.2	8.6	1.2
*I-E-Vis.Perc.-Const.-raw sc.	13.6	3.5	15.9	2.6	15.0	3.2
*I-F-Vis.Perc.-Const.	63.8	25.0	85.9	25.8	77.1	27.7
II-A - Sound Discrim.	21.4	4.6	22.7	3.0	22.2	3.8
*II-B - Aud. Perc.	20.2	5.5	24.7	3.3	22.9	4.8
*III-A - Memory-Visual	15.4	2.4	17.0	2.1	16.3	2.4
*III-B-Mem.-Immed.Mem.% [2]	41.4	19.5	56.8	17.6	50.6	19.9
III-C-Mem.-Immed. Mem.	17.7	7.6	19.6	7.5	18.8	7.6
*III-D-Mem.-Immed. Meaning	8.9	2.5	10.6	2.4	9.9	2.6
*III-E-Mem. Delayed	5.6	1.4	6.7	.7	6.2	1.2
*IV-A-Orientation - Time	20.2	3.8	24.1	3.8	22.6	4.3
*IV-B-Orientation - Size	16.0	1.3	17.1	1.0	16.7	1.2
*IV-C-Orientation - Midline	3.6	2.5	5.1	1.7	4.5	2.2
*IV-D-Orientation - Space	3.8	1.4	14.6	1.0	14.3	1.3
IV-E-Orientation - Size	4.9	.4	5.0	.2	4.9	.3
IV-F-Orientation - Space	9.3	1.2	9.6	1.0	9.5	1.0

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 7 yrs/8 mos - 8 yrs/1 mo
Page 2.

	EXPERIMENTAL N= 18		CONTROL N= 27		TOTAL N= 45	
ITEM	Mean	S.D.	Mean	S.D.	Mean	S.D.
V-A-Norm.Score [3] (time)	.0	1.1	.5	.8	-.3	1.0
V-A-Method	1.9	.4	2.2	.5	2.1	.5
*V-B-% Score [4] (total)	81.9	21.7	95.4	10.2	90.0	17.2
*V-C-Integ.-Symb.(Abs.)	22.6	4.3	26.1	4.9	24.7	5.0
*V-D-Integ.-Infer.Rsng.	15.2	3.1	17.3	1.7	16.5	2.6
*V-E-Integ.-Symb.(Nos.)	10.5	2.0	12.1	1.5	11.5	1.9
*VI-A-Fine Mot. Cont. (total)	8.5	1.8	10.2	1.5	9.5	1.8
VI-B-Eye-Hand Coord. (total)	3.0	.9	3.7	1.3	3.4	1.2
VII-Gr.Mot.Coord.-Forward	1.0	0.0	1.0	0.0	1.0	0.0
VII-Gr.Mot.Coord.-Backward	.9	.3	.9	.3	.9	.3
VII-Gr.Mot.Coord.-Sidewise	.9	.3	1.0	.2	.9	.2
VII-Gr.Mot.Coord.-Jumping	6.2	1.8	7.0	1.3	6.7	1.6
VII-Gr.Mot.Coord.-Identif.	8.2	.8	7.8	2.1	8.0	1.7
VII-Gr.Mot.Coord.-Imitation	2.9	.4	3.0	.4	2.9	.4
VII-Gr.Mot.Coord.-Obst.C.	2.9	.3	3.0	.2	2.9	.2
VII-Gr.Mot.Coord.-Total sc.	22.9	2.6	23.6	2.7	23.3	2.7
*VIII-A-Ling.Input-Total sc.	13.3	1.6	14.1	1.0	13.8	1.3
IX-A-Tactile-Man.Perc.-Total	3.9	.3	4.0	0.0	4.0	.2
IX-B-Tactile-Loc.of St. -Rt.	1.0	.5	.9	.5	.9	.5
IX-B-Tactile-Loc. of St.-Left	.9	.4	.9	.4	.9	.4
IX-C-Tact.-2pt.Disc.-1st Rt.	1.1	.5	1.0	.6	1.0	.6
IX-C-Tact.-2pt.Disc.-1st Left	1.3	.5	1.0	.5	1.1	.5
IX-C-Tact.-2pt.Disc.-2nd Rt.	1.4	.6	1.3	.6	1.3	.6
IX-C-Tact.-2pt.Disc.-2nd Left	1.4	.6	1.4	.7	1.4	.6
IX-D-Face-Hand-Ipsi (4scores)	3.5	1.1	3.8	.6	3.7	.8
IX-D-Face-Hand-Total score	9.1	1.3	9.7	.6	9.4	1.0
IX-E-Tact.Mov.Stim.-Total Sc.	6.4	1.8	7.3	1.3	7.0	1.6
**IX-F-Kin.M.M. (Left)	17.6	6.8	12.5	4.5	14.5	6.1
IX-F-Kin.M.M. (Right)	15.1	5.0	12.6	5.8	13.6	5.6
**IX-F-Kin.M.M. (Total)	32.7	10.7	25.1	7.6	28.1	9.7
IX-G-Tact. Man. Perc. Time-secs.-Trial A	527.0	192.0	466.9	154.4	491.0	173.0
IX-G-Tact. Man. Perc. ** Time-secs.-Trial B	462.9	220.7	316.6	134.7	375.1	188.4
IX-G-Tact. Man. Perc. Diff. A - B	64.1	89.3	150.3	178.9	115.8	155.5

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 7 yrs/8 mos - 8 yrs/1 mo
Page 3.

	EXPERIMENTAL N= 18		CONTROL N= 27		TOTAL N= 45	
ITEM	Mean	S.D.	Mean	S.D.	Mean	S.D.
X-Know. of L&R-Dom.	2.3	.7	2.7	.7	2.5	.7
X-Hand Pref. - Dom.	1.9	.8	1.5	.8	1.7	.8
X-Eye Dominance	1.6	.7	1.6	.6	1.6	.6
X-Foot Dominance	1.7	.9	1.7	.9	1.7	.9

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 8 yrs/2 mos - 8 yrs/7 mos

	EXPERIMENTAL N=23		CONTROL N=27		TOTAL N=50	
TEM	Mean	S.D.	Mean	S.D.	Mean	S.D.
rostig I	8.6	1.2	9.0	1.0	8.8	1.2
rostig II	8.6	1.3	9.2	1.1	9.0	1.2
rostig III	7.7	1.9	8.6	1.3	8.2	1.6
rostig IV	8.6	1.2	8.8	1.0	8.7	1.1
rostig V	9.4	.8	9.5	.6	9.5	.7
TPA - Vis. Dec.	16.9	2.0	17.0	2.6	16.9	2.4
TPA - Mot. Enc.	15.7	4.2	17.6	2.5	16.8	3.5
TPA - Voc. Enc.	19.6	7.6	21.3	4.3	20.5	6.1
aven Percentile	53.0	28.8	63.7	30.5	58.8	30.2
ender Standard [1]	.6	.9	.0	.6	.3	.8
-A - Vis. Perc. - Form	14.9	3.7	15.8	3.6	15.4	3.7
-B - Vis. Disc.	21.3	3.8	23.6	1.7	22.6	3.1
-C-Vis.Perc.-Space-total sc.	11.6	.8	11.4	2.1	11.5	1.6
-D-Vis.Perc.-Const.-raw sc.	8.4	1.2	8.7	1.0	8.6	1.1
-E-Vis.Perc.-Const.-raw sc.	14.1	3.0	16.5	1.8	15.4	2.7
-F-Vis.Perc.-Const.	73.8	31.4	109.2	34.0	92.9	37.3
I-A - Sound Disc.	20.7	4.4	22.2	3.6	21.6	4.1
I-B - Aud. Perc.	20.7	4.0	24.1	3.5	22.5	4.1
II-A - Memory-Visual	15.9	2.8	16.7	2.1	16.4	2.5
II-B-Mem.-Immed.Mem.% [2]	39.0	18.6	42.4	17.7	40.8	18.2
II-C-Mem.-Immed. Mem.	22.1	7.6	21.3	6.2	21.7	6.9
II-D-Mem.-Immed. Meaning	9.9	2.6	11.0	3.2	10.5	3.0
II-E-Mem. Delayed	6.0	1.6	6.4	.8	6.2	1.2
V-A-Orientation - Time	21.2	4.2	24.8	3.0	23.1	4.0
V-B-Orientation - Size	16.1	1.6	17.4	.6	16.8	1.4
V-C-Orientation - Midline	3.2	2.8	3.7	2.6	3.5	2.7
V-D-Orientation - Space	13.3	1.8	14.1	1.2	13.7	1.5
V-E-Orientation - Size	5.0	.2	5.0	.2	5.0	.2
V-F-Orientation - Space	9.0	1.0	9.5	1.2	9.3	1.2

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 8 yrs/2 mos - 8 yrs/7 mos
Page 2.

ITEM	EXPERIMENTAL N=23		CONTROL N=27		TOTAL N=50	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
V-A-Norm.Score [3] (time)	.0	1.0	.0	1.0	.0	1.0
V-A-Method	2.0	.5	2.2	.6	2.1	.5
V-B-% score [4] (total)	91.3	13.8	96.6	6.1	94.2	10.7
V-C-Integ.-Symb.(Abs.)	21.3	5.4	23.4	5.1	22.5	5.4
V-D-Integ.-Infer.Rsng.	15.4	2.3	17.1	2.5	16.3	2.6
V-E-Integ.-Symb.(Nos.)	11.4	1.3	12.1	1.6	11.8	1.5
*VI-A-Fine Mot. Cont.(total)	9.0	1.2	10.5	1.3	9.8	1.5
VI-B-Eye-Hand Coord. (total)	2.9	1.0	3.4	1.0	3.2	1.0
VII-Gr.Mot.Coord.-Forward	1.0	.2	1.0	0.0	1.0	.1
VII-Gr.Mot.Coord.-Backward	.8	.4	1.0	.2	1.0	.3
VII-Gr.Mot.Coord.-Sidewise	.9	.3	1.0	.2	.9	.2
VII-Gr.Mot.Coord.-Jumping	6.5	1.7	6.7	1.4	6.6	1.5
*VII-Gr.Mot.Coord.-Identif.	7.1	2.3	8.4	1.2	7.8	1.9
VII-Gr.Mot.Coord.-Imitation	3.0	.4	2.9	.4	2.9	.4
VII-Gr.Mot.Coord.-Obst.C.	2.8	.4	2.8	.5	2.8	.4
*VII-Gr.Mot.Coord.-Total sc.	22.0	3.6	23.8	2.1	23.0	3.0
VIII-A-Ling.Input-Total sc.	13.3	1.8	13.9	1.2	13.6	1.5
IX-A-Tactile-Man.Perc.-Total	4.0	0.0	4.0	.2	4.0	.1
IX-B-Tactile-Loc.of St.-Rt.	1.1	.6	1.0	.6	1.1	.6
IX-B-Tactile-Loc. of St.-Left	1.0	.6	.7	.4	.8	.5
IX-C-Tact.-2pt.Disc.-1st Rt.	1.4	.7	1.6	.7	1.2	.7
IX-C-Tact.-2pt.Disc.-1st Left	1.1	.5	1.1	.7	1.1	.6
IX-C-Tact.-2pt.Disc.-2nd Rt.	1.5	.7	1.2	.6	1.4	.7
IX-C-Tact.-2pt.Disc.-2nd Left	1.4	.7	1.4	.7	1.4	.7
*IX-D-Face-Hand-Ipsi (4scores)	3.6	1.0	4.0	0.0	3.8	.7
IX-D-Face-Hand-Total score	9.3	1.1	9.7	.5	9.5	.9
IX-E-Tact.Mov.Stim.-Total sc.	6.5	1.6	7.1	1.1	6.8	1.4
IX-F-Kin.M.M. (Left)	16.7	6.8	13.9	4.8	15.2	5.9
*IX-F-Kin.M.M. (Right)	14.1	6.8	11.0	2.9	12.4	5.3
*IX-F-Kin.M.M. (Total)	30.9	11.8	24.9	6.0	27.7	9.6
IX-G-Tact. Man. Perc. Time-secs.-Trial A	529.5	190.1	438.5	201.9	480.4	201.7
IX-G-Tact. Man. Perc. Time-secs.-Trial B	387.9	173.1	331.0	143.1	357.2	160.2
IX-G-Tact. Man. Perc. Diff A - B	141.6	166.4	107.6	226.6	123.2	201.9

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 8 yrs/2 mos - 8 yrs/7 mos
Page 3.

ITEM	EXPERIMENTAL N=23 Mean	S.D.	CONTROL N=27 Mean	S.D.	TOTAL N=50 Mean	S.D.
X-Know. of L&R-Dom.	2.6	.6	2.8	.4	2.7	.5
X-Hand Pref. - Dom.	1.4	.8	1.2	.5	1.3	.7
X-Eye Dominance	1.5	.6	1.6	.6	1.5	.6
X-Foot Dominance	1.6	.9	1.9	1.0	1.7	1.0

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 8 yrs/8 mos - 9 yrs/1 mo

	EXPERIMENTAL N=29		CONTROL N=25		TOTAL N=54	
ITEM	Mean	S.D.	Mean	S.D.	Mean	S.D.
*Frostig I	8.7	1.1	9.3	1.0	8.9	1.1
Frostig II	8.8	1.2	8.8	.9	8.8	1.1
*Frostig III	7.4	1.7	8.6	1.2	8.0	1.6
*Frostig IV	8.0	1.4	9.0	1.1	8.4	1.4
Frostig V	9.2	.9	9.7	.7	9.4	.8
*ITPA - Vis. Dec.	16.3	2.3	17.6	1.6	16.9	2.1
ITPA - Mot. Enc.	16.5	2.9	17.8	3.2	17.1	3.1
ITPA - Voc. Enc.	21.2	6.4	22.3	4.4	21.7	5.6
*Raven Percentile	45.7	24.7	60.2	26.2	52.4	26.4
Bender Standard [1]	1.2	1.4	1.0	1.1	1.1	1.3
I-A - Vis. Perc.-Form	16.1	3.4	17.8	3.1	16.9	3.4
*I-B - Vis. Disc.	21.7	3.1	23.8	1.5	22.7	2.7
I-C-Vis.Perc.-Space-total sc.	11.4	1.2	11.7	.6	11.5	1.0
I-D-Vis.Perc.-Const.-raw sc.	8.0	1.3	8.7	1.2	8.3	1.3
*I-E-Vis.Perc.-Const.-raw sc.	15.2	2.8	17.6	1.5	16.3	2.6
*I-F-Vis.Perc.-Const.	86.6	35.9	127.1	39.2	105.3	42.6
II-A- Sound Disc.	22.3	4.0	23.2	3.4	22.7	3.7
*II-B- Aud. Perc.	22.1	3.7	24.8	2.7	23.4	3.5
*III-A - Memory-Visual	15.7	2.7	17.4	2.3	16.5	2.7
III-B-Mem.-Immed.Mem.% [2]	45.2	20.3	52.4	17.6	48.5	19.4
*III-C-Mem.-Immed. Mem.	22.7	5.0	28.0	8.2	25.2	7.2
III-D-Mem.-Immed. Meaning	10.6	2.6	11.7	3.2	11.1	2.9
III-E-Mem. Delayed	6.1	1.4	6.5	.8	6.3	1.2
IV-A-Orientation - Time	23.3	3.7	25.2	3.4	24.2	3.7
IV-B-Orientation - Size	16.2	1.6	17.3	.8	16.7	1.4
*IV-C-Orientation - Midline	3.9	2.5	5.2	1.3	4.5	2.2
IV-D-Orientation - Space	13.7	1.3	14.1	1.1	13.9	1.2
IV-E-Orientation - Size	5.0	.2	5.0	0.0	5.0	.1
IV-F-Orientation - Space	9.6	1.2	9.5	1.2	9.5	1.2

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 8 yrs/8 mos - 9 yrs/1 mo
Page 2.

	EXPERIMENTAL N=29		CONTROL N=25		TOTAL N=54	
ITEM	Mean	S.D.	Mean	S.D.	Mean	S.D.
V-A-Norm.Score [3](time)	.2	1.0	.1	.8	.0	.9
V-A-Method	2.0	.7	2.5	.5	2.2	.6
V-B-% score [4](total)	92.0	8.0	98.0	4.3	94.8	7.2
V-C-Integ.-Symb.(Abs.)	22.8	6.1	25.1	5.1	23.8	5.8
V-D-Integ.-Infer.Rsng.	16.2	2.3	17.9	1.4	17.0	2.1
V-E-Integ.-Symb.(Nos.)	11.6	1.6	12.6	1.6	12.0	1.7
VI-A-Fine Mot. Cont.(total)	9.4	1.0	10.0	1.1	9.7	1.1
VI-B-Eye-Hand Coord. (total)	2.9	1.1	3.8	1.0	3.3	1.2
VII-Gr.Mot.Coord.-Forward	1.0	.2	1.0	0.0	1.0	.1
VII-Gr.Mot.Coord.-Backward	.9	.3	1.0	.2	.9	.3
VII-Gr.Mot.Coord.-Sidewise	.9	.2	.9	.3	.9	.3
VII-Gr.Mot.Coord.-Jumping	6.9	1.3	7.2	1.0	7.0	1.2
VII-Gr.Mot.Coord.-Identif.	7.9	1.6	8.6	.5	8.2	1.3
VII-Gr.Mot.Coord.-Imitation	3.1	.4	3.0	.3	3.0	.4
VII-Gr.Mot.Coord.-Obst.C.	2.9	.4	2.8	.6	2.9	.5
VII-Gr.Mot.Coord.-Total sc.	23.6	2.2	24.5	1.4	24.0	1.9
VIII-A-Ling.Input-Total sc.	13.4	1.1	14.2	.9	13.8	1.1
IX-A-Tactile-Man.Perc.-Total	4.0	0.0	3.9	.4	3.9	.3
IX-B-Tactile-Loc.of St.-Rt.	.9	.6	.9	.4	.9	.5
IX-B-Tactile-Loc. of St.-Left	.9	.5	.8	.3	.9	.5
IX-C-Tact.-2pt.Disc.-1st Rt.	1.1	.6	1.0	.5	1.1	.5
IX-C-Tact.-2pt.Disc.-1st Left	1.1	.5	1.2	.5	1.1	.5
IX-C-Tact.-2pt.Disc.-2nd Rt.	1.4	.5	1.2	.6	1.3	.6
IX-C-Tact.-2pt.Disc.-2nd Left	1.2	.6	1.1	.4	1.2	.6
IX-D-Face-Hand-Ipsi(4 scores)	3.6	.9	3.7	.8	3.6	.9
IX-D-Face-Hand-Total score	9.2	1.0	9.6	.8	9.4	.9
IX-E-Tact.Mov.Stim.-Total sc.	6.7	1.5	7.3	1.4	7.0	1.5
IX-F-Kin.M.M. (Left)	12.9	4.4	12.2	3.7	12.6	4.1
IX-F-Kin.M.M. (Right)	13.0	6.2	11.8	4.2	12.4	5.4
IX-F-Kin.M.M. (Total)	25.9	9.3	24.0	7.1	25.0	8.4
IX-G-Tact. Man. Perc. Time-secs.-Trial A	401.8	147.7	417.3	163.8	409.0	155.5
IX-G-Tact. Man. Perc. Time-secs.-Trial B	316.6	160.3	293.6	190.6	305.9	175.3
IX-G-Tact. Man. Perc. Diff. A - B	85.3	130.5	123.7	148.8	103.1	140.6

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 8 yrs/8 mos - 9 yrs/1 mo
Page 3.

	EXPERIMENTAL N=29		CONTROL N=25		TOTAL N=54	
ITEM	Mean	S.D.	Mean	S.D.	Mean	S.D.
X-Know. of L&R-Dom.	2.6	.8	2.9	.4	2.7	.7
X-Hand Pref. - Dom.	1.8	1.0	1.4	.7	1.6	.9
X-Eye Dominance	1.8	.6	1.8	.6	1.8	.6
X-Foot Dominance	1.7	.9	2.1	.9	1.9	.9

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 9 yrs/2 mos - 9 yrs/7 mos

ITEM	EXPERIMENTAL N=12 Mean	S.D.	CONTROL N=8 Mean	S.D.	TOTAL N=20 Mean	S.D.
*Frostig I	7.6	1.5	9.1	1.0	8.2	1.5
Frostig II	9.2	1.1	9.1	1.3	9.2	1.2
Frostig III	7.6	1.5	7.9	2.2	7.7	1.8
Frostig IV	8.2	1.8	8.0	1.2	8.2	1.6
*Frostig V	8.3	1.2	9.8	.7	8.9	1.3
ITPA - Vis. Dec.	17.5	1.4	16.9	1.4	17.2	1.4
ITPA - Mot. Enc.	18.1	2.8	16.1	2.0	17.3	2.7
ITPA - Voc. Enc.	20.9	5.3	21.1	3.9	21.0	4.8
Raven Percentile	31.7	22.3	47.5	30.0	38.0	26.8
*Bender Standard [1]	2.4	1.9	.4	1.0	1.6	1.9
I-A - Vis. Perc. - Form	16.7	3.3	15.0	4.6	16.0	3.9
I-B - Vis. Disc.	22.2	2.8	24.1	.9	23.0	2.4
I-C-Vis.Perc.-Space-total sc.	11.7	.5	11.9	.3	11.7	.4
*I-D-Vis.Perc.-Const.-raw sc.	7.9	1.1	9.1	.3	8.4	1.1
**I-E-Vis.Perc.-Const.-raw sc.	13.3	2.6	17.5	2.0	15.0	3.1
**I-F-Vis.Perc.-Const.	64.1	26.4	149.6	50.3	98.3	56.4
*II-A - Sound Disc.	19.9	6.0	25.4	3.1	22.1	5.7
**II-B - Aud. Perc.	18.7	3.0	24.1	3.5	20.8	4.2
III-A - Memory-Visual	17.4	2.3	17.5	2.1	17.5	2.2
III-B-Mem.-Immed.Mem.% [2]	46.2	14.3	35.0	10.6	41.7	14.0
III-C-Mem.-Immed. Mem.	25.9	8.6	22.0	4.0	24.4	7.4
III-D-Mem.-Immed. Meaning	12.3	3.9	13.8	4.8	12.9	4.4
III-E-Mem. Delayed	6.4	.8	6.4	1.1	6.4	1.0
*IV-A-Orientation - Time	21.0	4.3	25.5	2.3	22.8	4.2
IV-B-Orientation - Size	17.1	.6	17.1	.8	17.1	.7
IV-C-Orientation - Midline	3.2	2.6	3.8	2.9	3.4	2.7
IV-D-Orientation - Space	13.8	1.2	14.2	1.3	14.0	1.3
IV-E-Orientation - Size	4.9	.3	5.0	0.0	5.0	.2
IV-F-Orientation - Space	8.8	1.3	9.5	.5	9.1	1.1
**V-A-Norm. Score [3] (time)	1.0	.8	.3	.8	.4	1.1
**V-A-Method	1.5	.5	2.5	.5	1.9	.7
V-B-% score [4] (total)	97.2	7.1	95.8	5.9	96.7	6.7
V-C-Integ.-Symb.(Abs.)	23.6	6.5	24.4	4.9	23.9	5.9
V-D-Integ.-Infer. Rsng.	17.2	2.3	17.0	1.9	17.1	2.2
V-E-Integ.-Symb.(Nos.)	11.0	1.8	12.5	1.9	11.6	2.0

COGNITIVE-MOTOR TEST BATTERY
NORMATIVE DATA
AGE GROUP - 9 yrs/2 mos - 9 yrs/7 mos
Page 2.

ITEM	EXPERIMENTAL N=12		CONTROL N=8		TOTAL N=20	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
**VI-A-Fine Mot. Cont. (total)	8.3	1.5	10.4	.7	9.2	1.6
*VI-B-Eye-Hand Coord. (total)	2.8	.9	3.9	.8	3.2	1.0
VII-Gr.Mot.Coord.-Forward	.9	.3	1.0	0.0	1.0	.2
VII-Gr.Mot.Coord.-Backward	.8	.4	.9	.3	.8	.4
VII-Gr.Mot.Coord.-Sidewise	.9	.3	1.0	0.0	1.0	.2
VII-Gr.Mot.Coord.-Jumping	5.9	1.6	7.1	1.3	6.4	1.6
VII-Gr.Mot.Coord.-Identif.	7.7	.9	7.9	1.4	7.8	1.1
VII-Gr.Mot.Coord.-Imitation	3.0	.4	2.8	.4	2.9	.4
VII-Gr.Mot.Coord.-Obst.C.	2.8	.6	2.9	.3	2.8	.5
VII-Gr.Mot.Coord.-Total sc.	22.0	2.9	23.5	1.9	22.6	2.6
VIII-A-Ling.Input-Total Sc.	13.0	1.6	14.0	1.0	13.4	1.5
IX-A-Tactile-Man.Perc.-Total	4.0	0.0	3.9	.3	4.0	.2
IX-B-Tactile-Loc. of St.-Rt.	.8	.7	.8	.4	.8	.6
IX-B-Tactile-Loc. of St.-Left	.6	.3	.8	.4	.7	.3
IX-C-Tact.-2pt. Disc.-1st Rt.	1.0	.5	.9	.4	.9	.5
IX-C.-Tact.-2pt.Disc.-1st Left	1.0	.4	1.0	.2	1.0	.3
IX-C-Tact-2pt.Disc.-2nd Rt.	1.4	.7	1.0	.4	1.2	.7
IX-C-Tact.-2pt.Disc.-2nd Left	1.0	.3	1.2	.5	1.1	.4
IX-D-Face-Hand-Ipsi (4 scores)	3.8	.6	3.8	.4	3.8	.5
IX-D-Face-Hand-total score	9.8	.8	9.8	.4	9.8	.7
IX-E-Tact.Mov.Stim.-Total sc.	6.2	1.5	7.8	1.6	6.8	1.7
IX-F.-Kin.M.M. (Left)	14.2	4.6	13.9	4.5	14.1	4.5
IX-F-Kin.M.M. (Right)	10.9	4.7	12.9	4.4	11.7	4.7
IX-F-Kin.M.M. (Total)	25.1	8.3	26.8	8.0	25.8	8.2
IX-G-Tact. Man. Perc. Time-secs.-Trial A	419.6	139.3	581.0	198.1	484.2	183.3
IX-G-Tact. Man. Perc. Time-secs.-Trial B	320.6	169.4	356.1	146.6	334.8	161.7
* IX-G-Tact. Man. Perc. Diff. A - B	99.0	123.1	224.9	85.8	149.4	125.9
*X-Know. of L&R - Dom.	2.2	.7	2.9	.3	2.5	.7
X-Hand Pref. - Dom.	1.4	.8	1.0	0.0	1.2	.6
X-Eye Dominance	1.8	.6	1.6	.7	1.7	.6
*X-Foot Dominance	1.9	1.0	1.1	.3	1.6	.9

APPENDIX E

Scoring Examples:

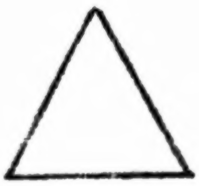
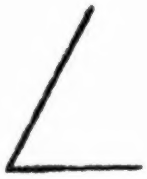
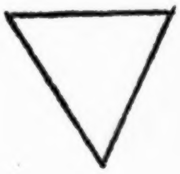
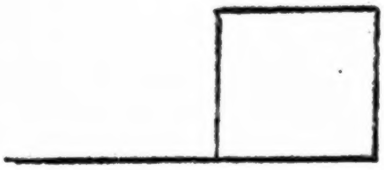
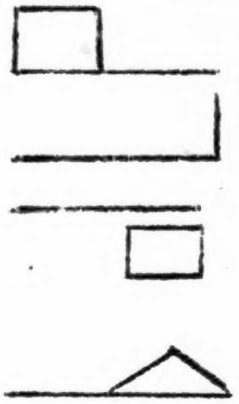
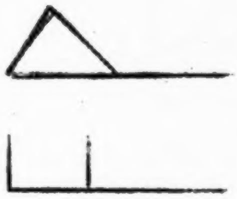
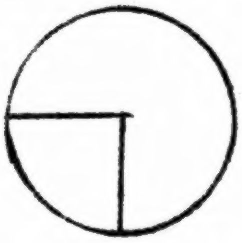
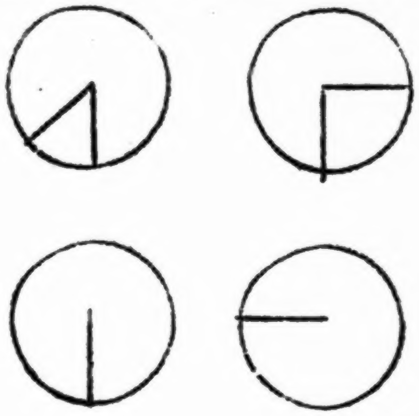
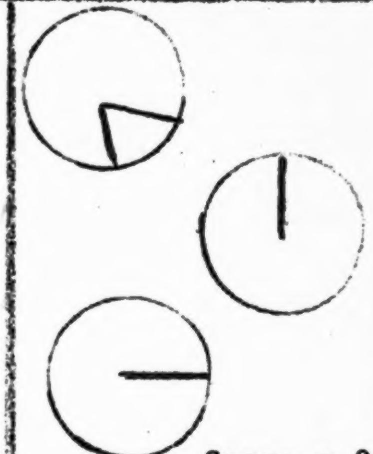
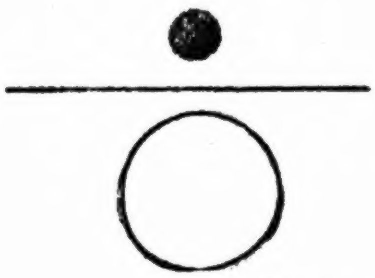
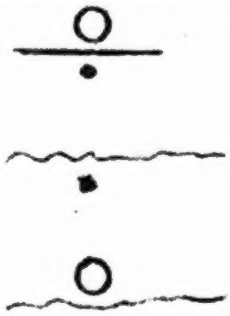
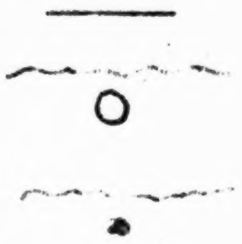
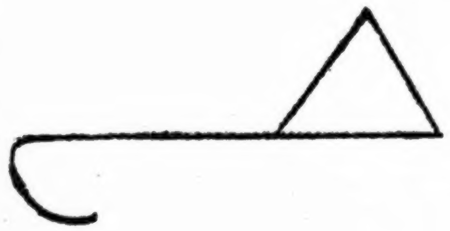
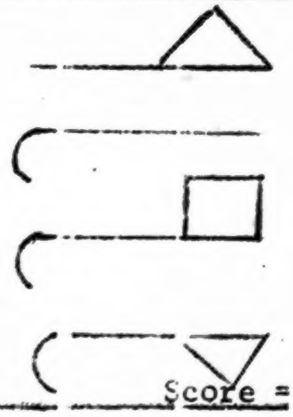
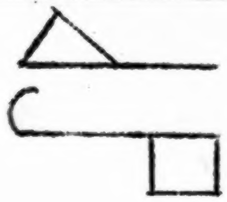
Test III-A

Test VI-A

Test VI-B

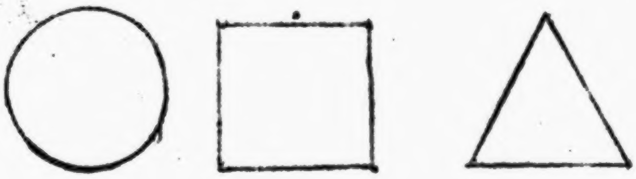
APPENDIX E

TEST III-A
Visual Memory - Form
SCORING EXAMPLES

1.  Score = 1	 Score = 1/2	 Score = 0
2.  Score = 1	 Score = 1/2	 Score = 0
3.  Score = 1	 Score = 1/2	 Score = 0
4.  Score = 1	 Score = 1/2	 Score = 0
5.  Score = 1	 Score = 1/2	 Score = 0

TEST III-A
EXAMPLES OF PARTIAL CREDIT

6.



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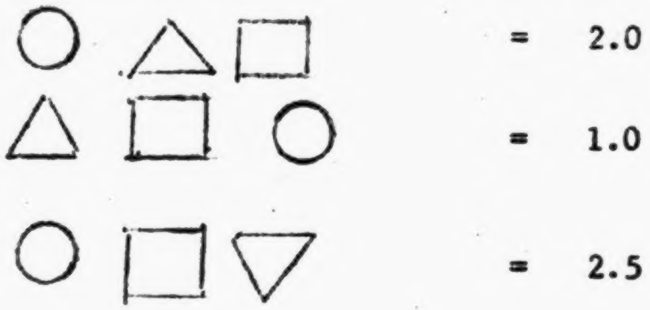

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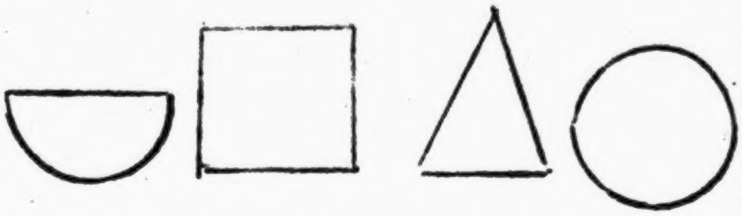

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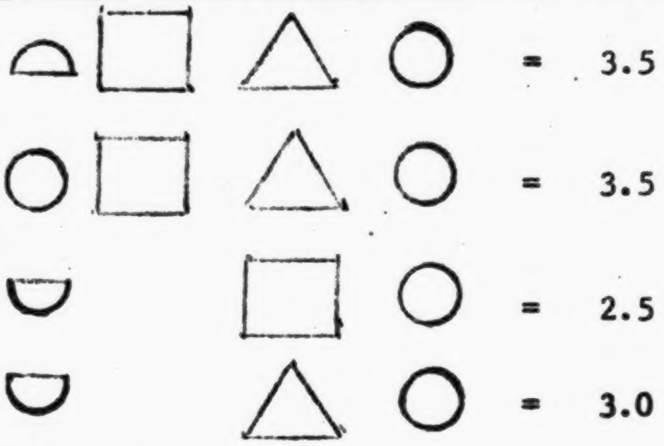

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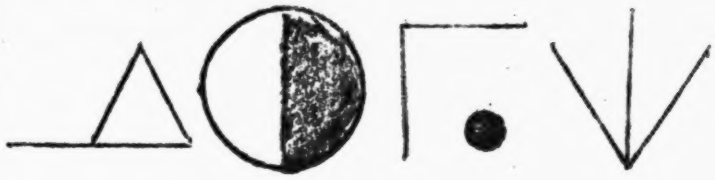

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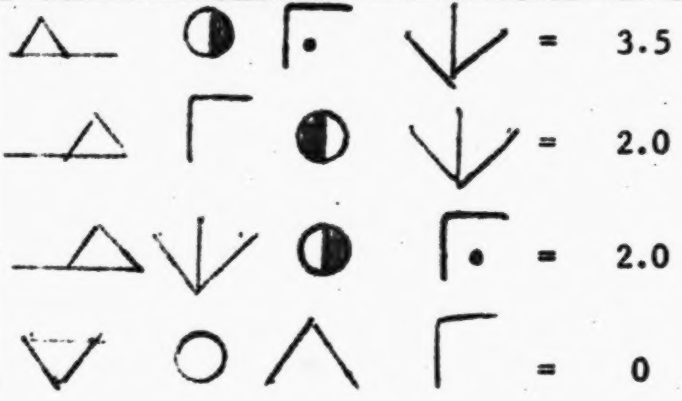

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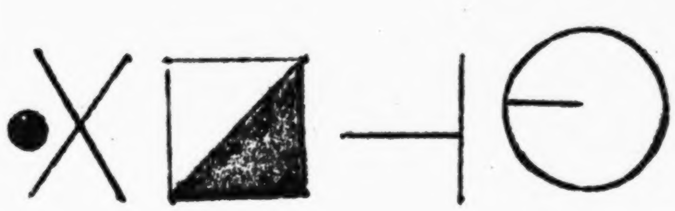

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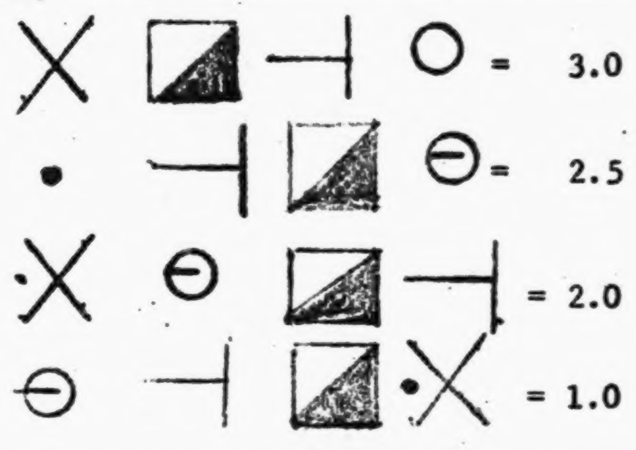

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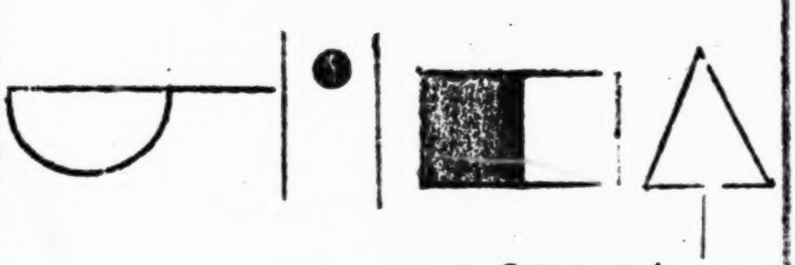

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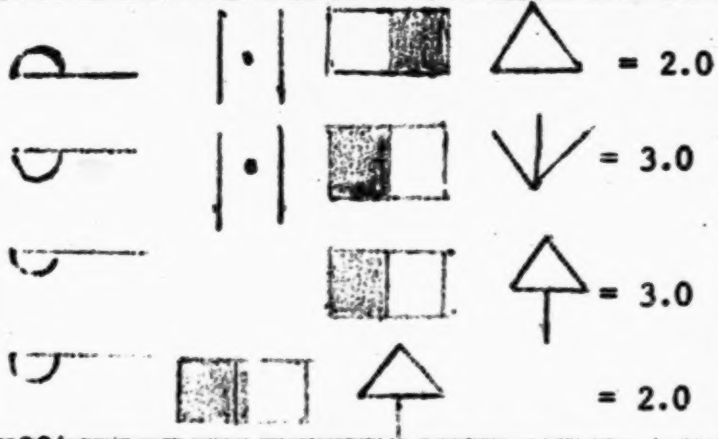

TEST VI-A - Inadequate
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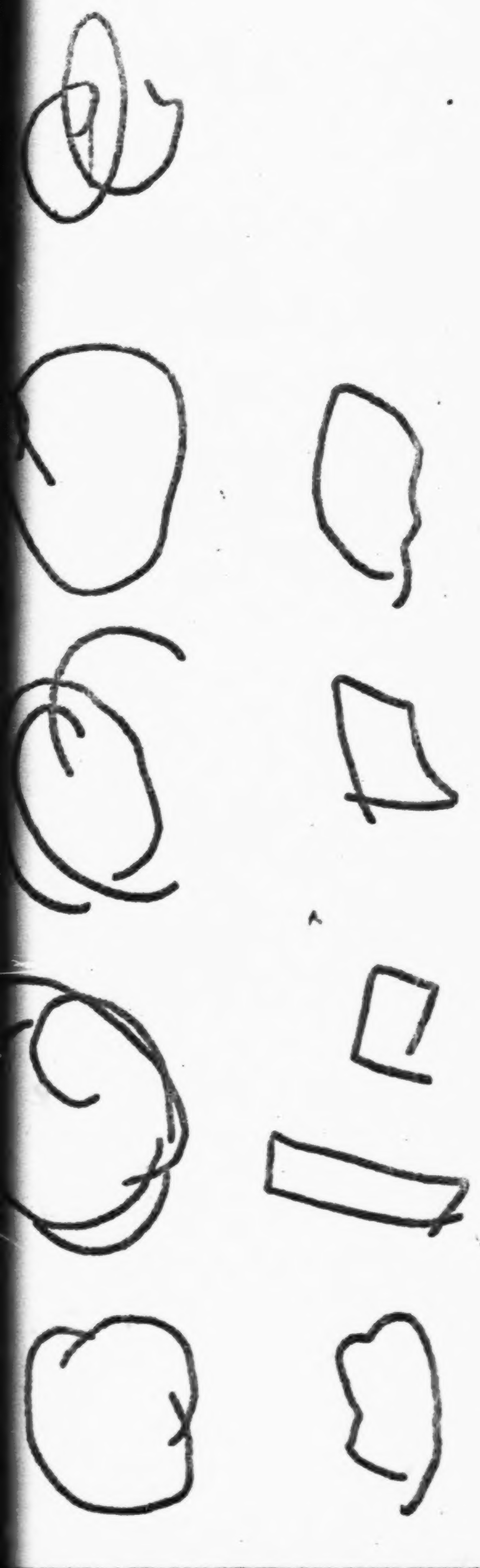
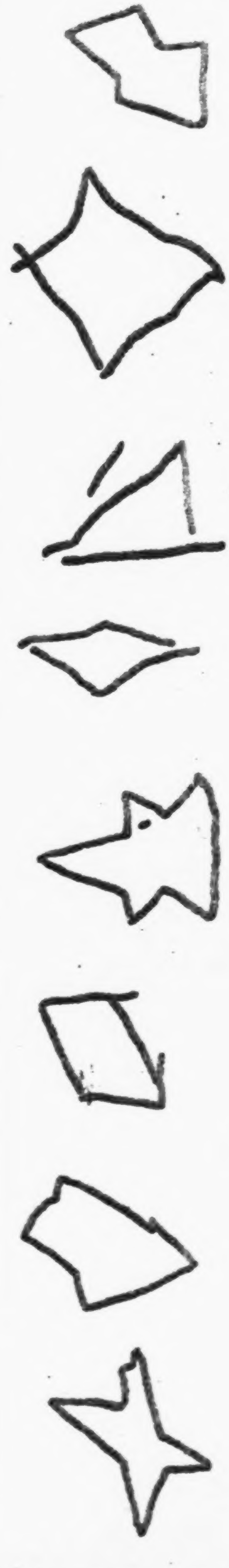
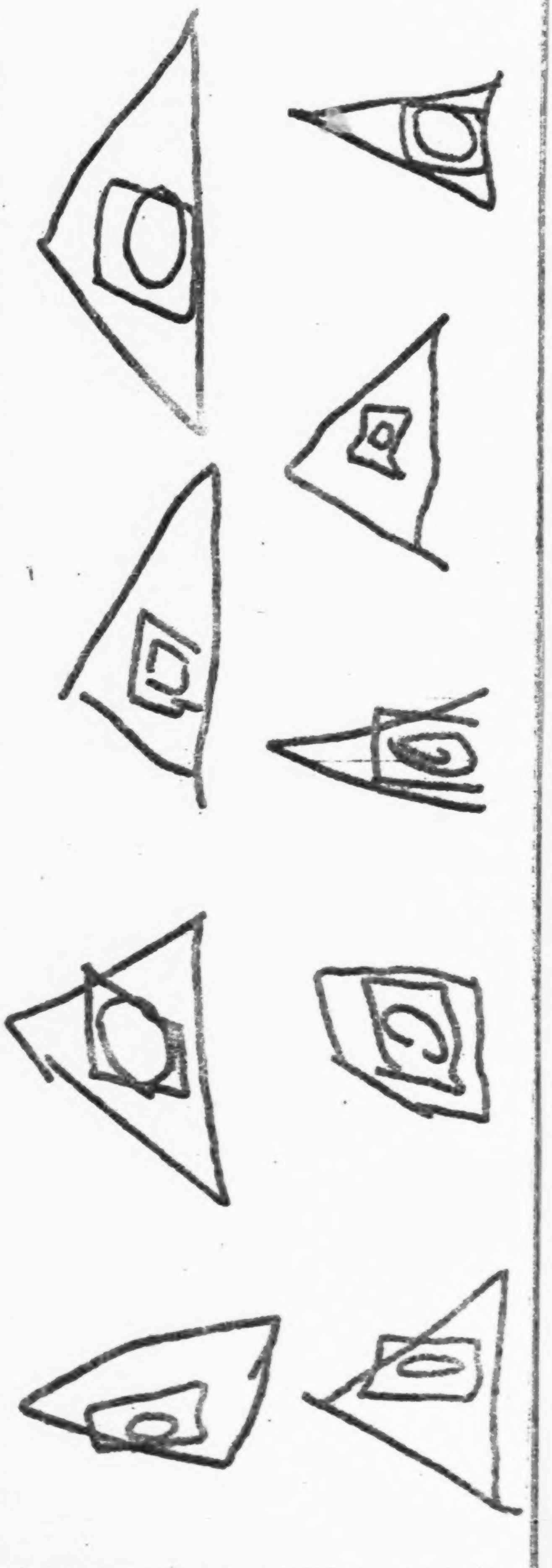
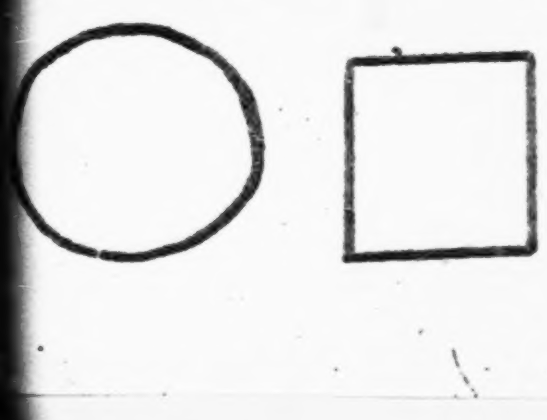
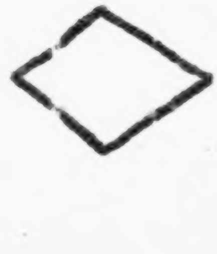
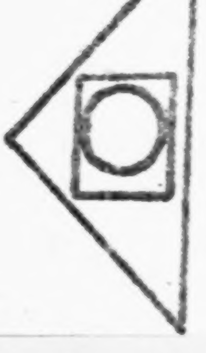


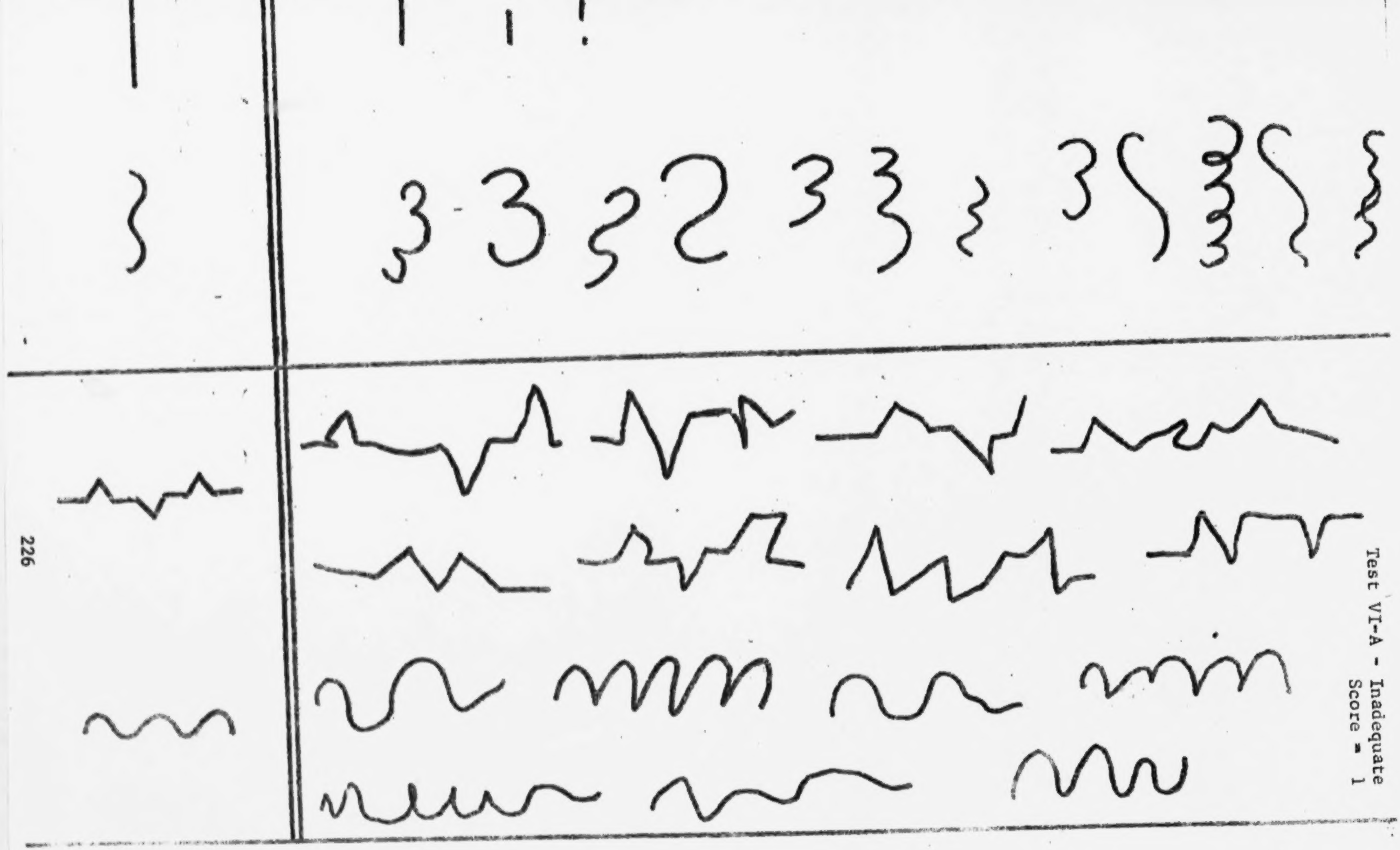








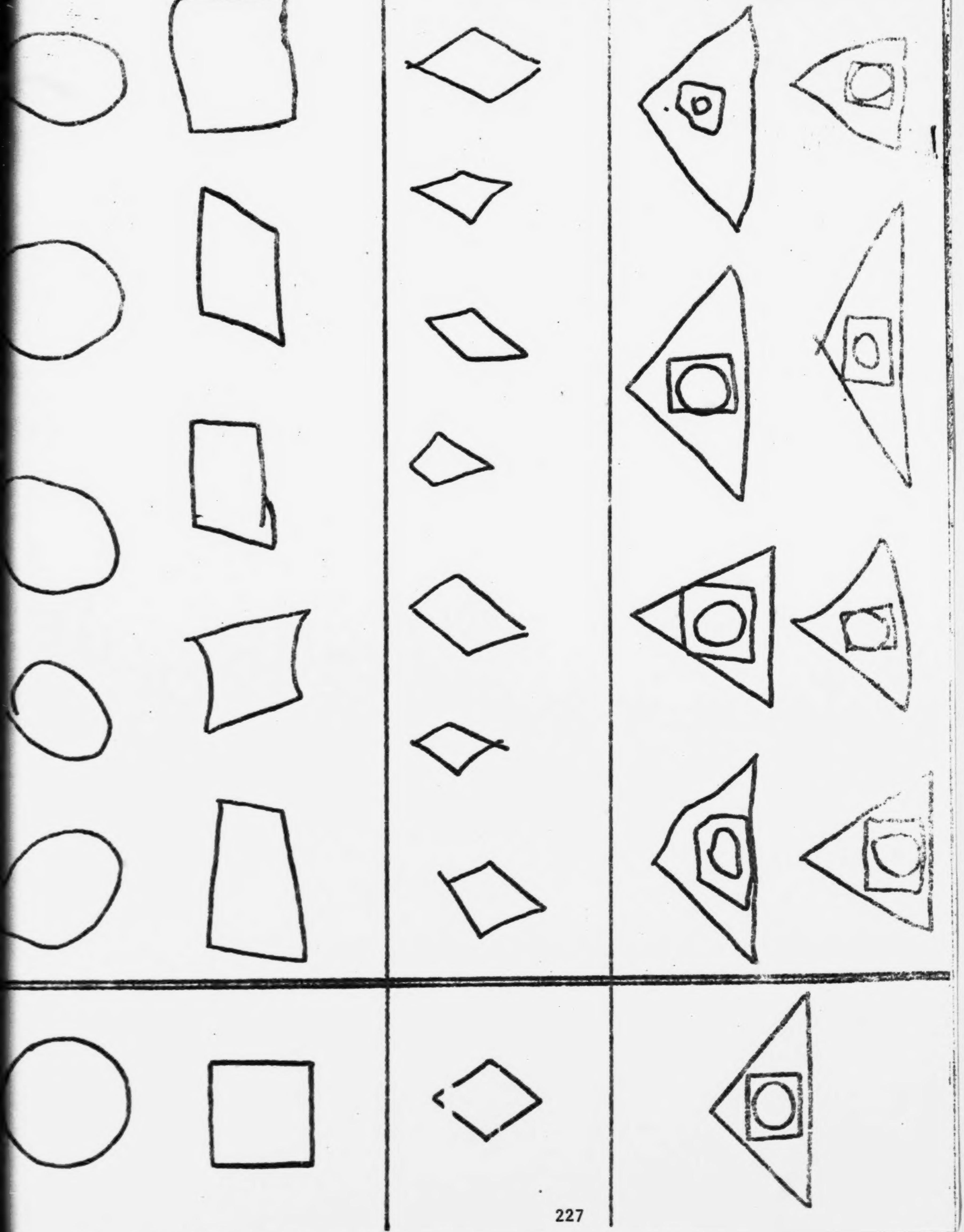




Test VI-A - Inadequate
Score = 1

Figure 4. Samples of Inadequate Performance on the L-R Fine Motor Control Te

TEST VI-A - Transitional
Score = 2



Test VI-A - Transitional
Score = 2

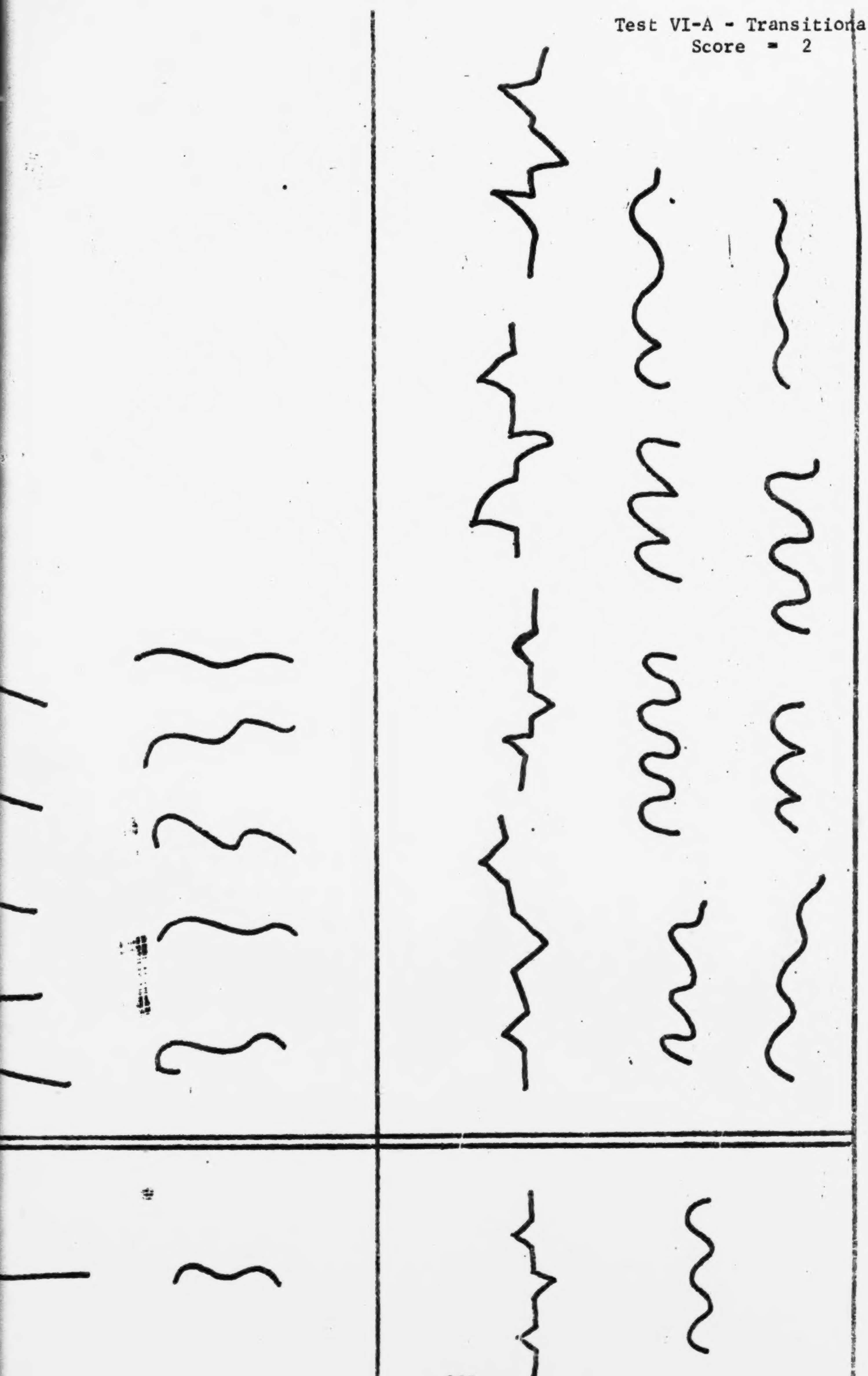
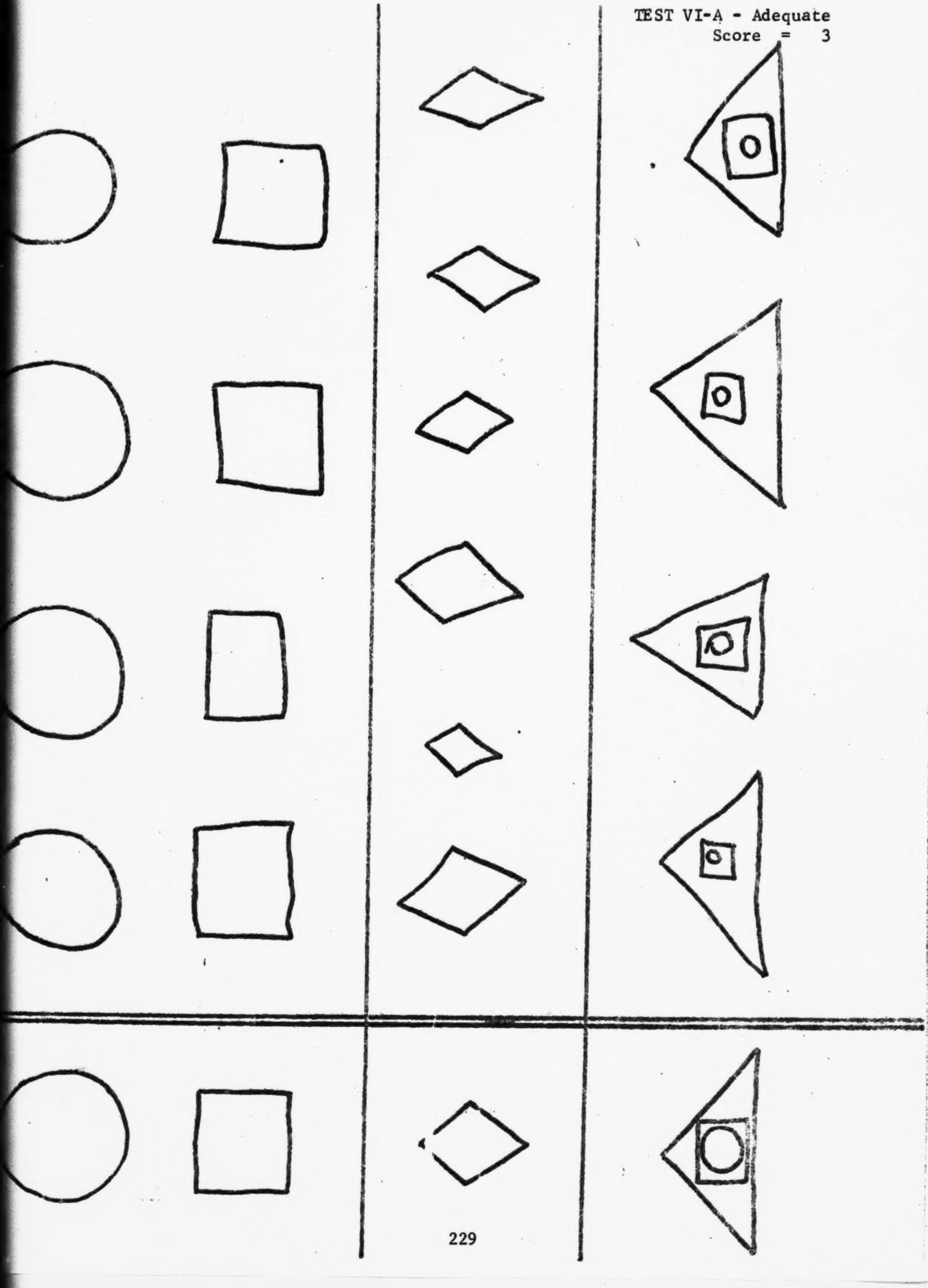
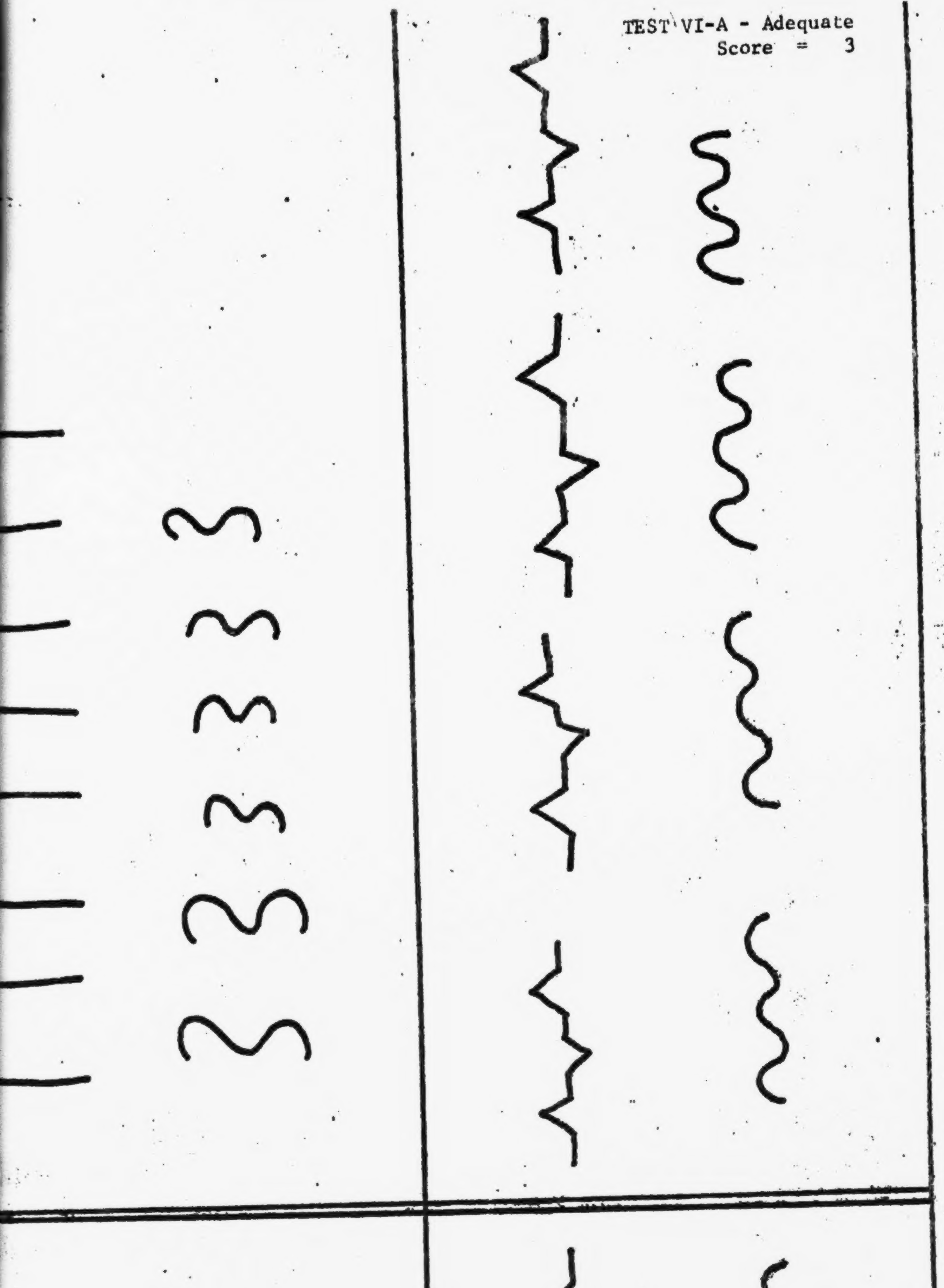


Figure 5 Samples of Transitional Performance on the L-R Fine Motor Control Test

TEST VI-A - Adequate
Score = 3





TEST VI-A - Adequate
Score = 3

Figure 6. Samples of Adequate Performance on the L-R Fine Motor Control Test.

TEST VI-B - Inadequate
Score = 1

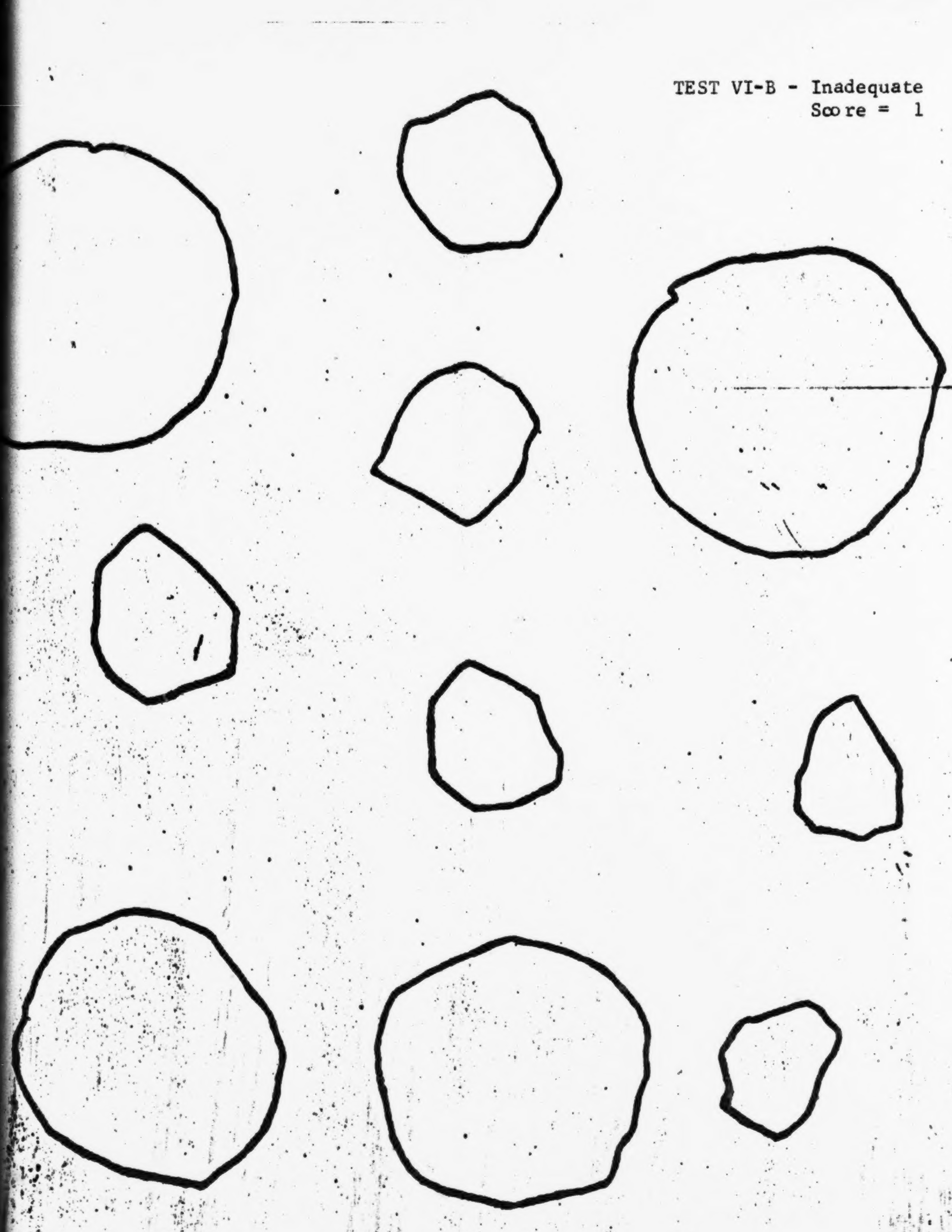


Figure 7. Samples of Inadequate Performance on Eye-Hand Coordination

TEST VI-B - Transitional
Score = 2

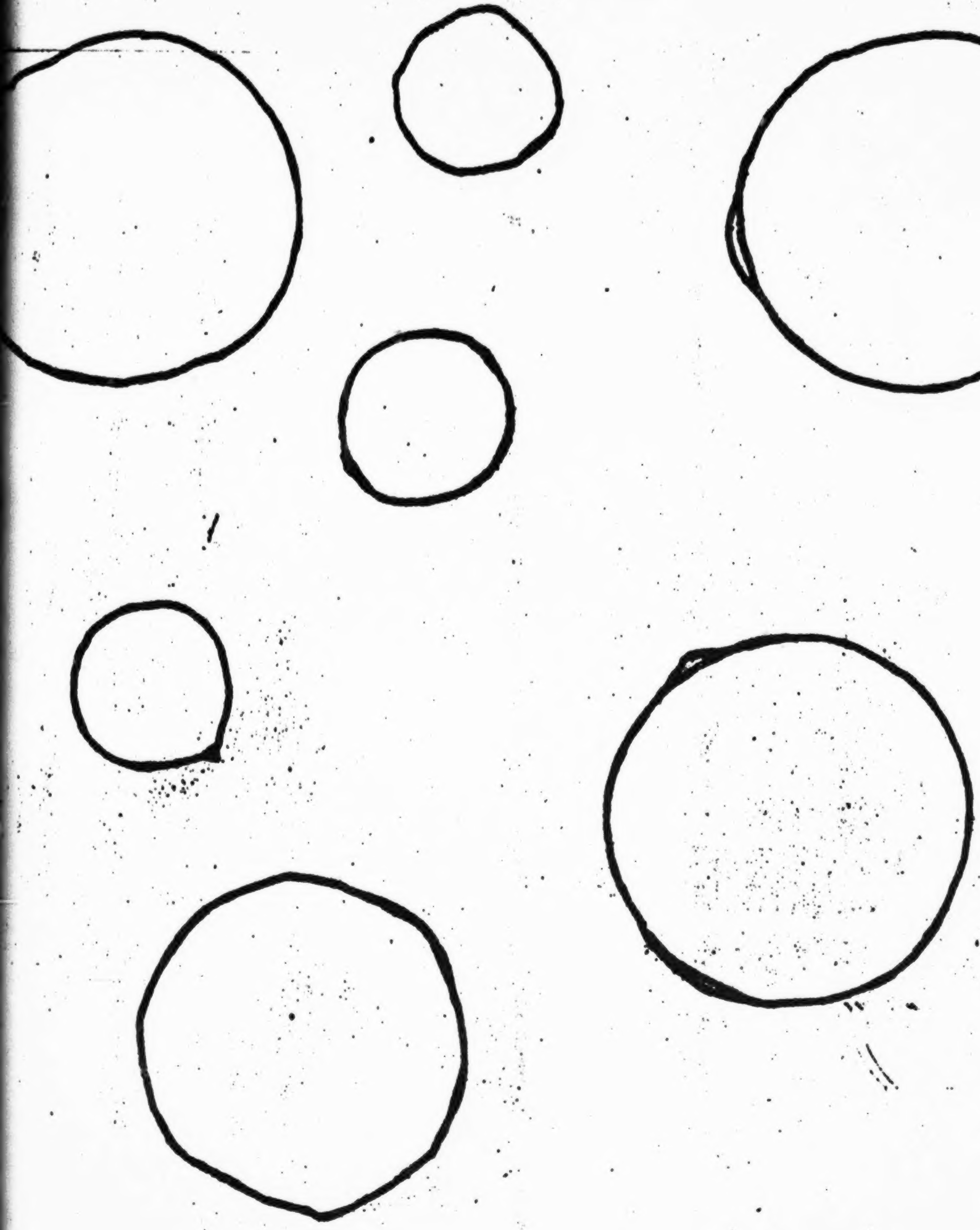


Figure 8. Samples of Transitional Performance on Eye Hand Coordination

TEST VI-B - Adequate
Score = 3

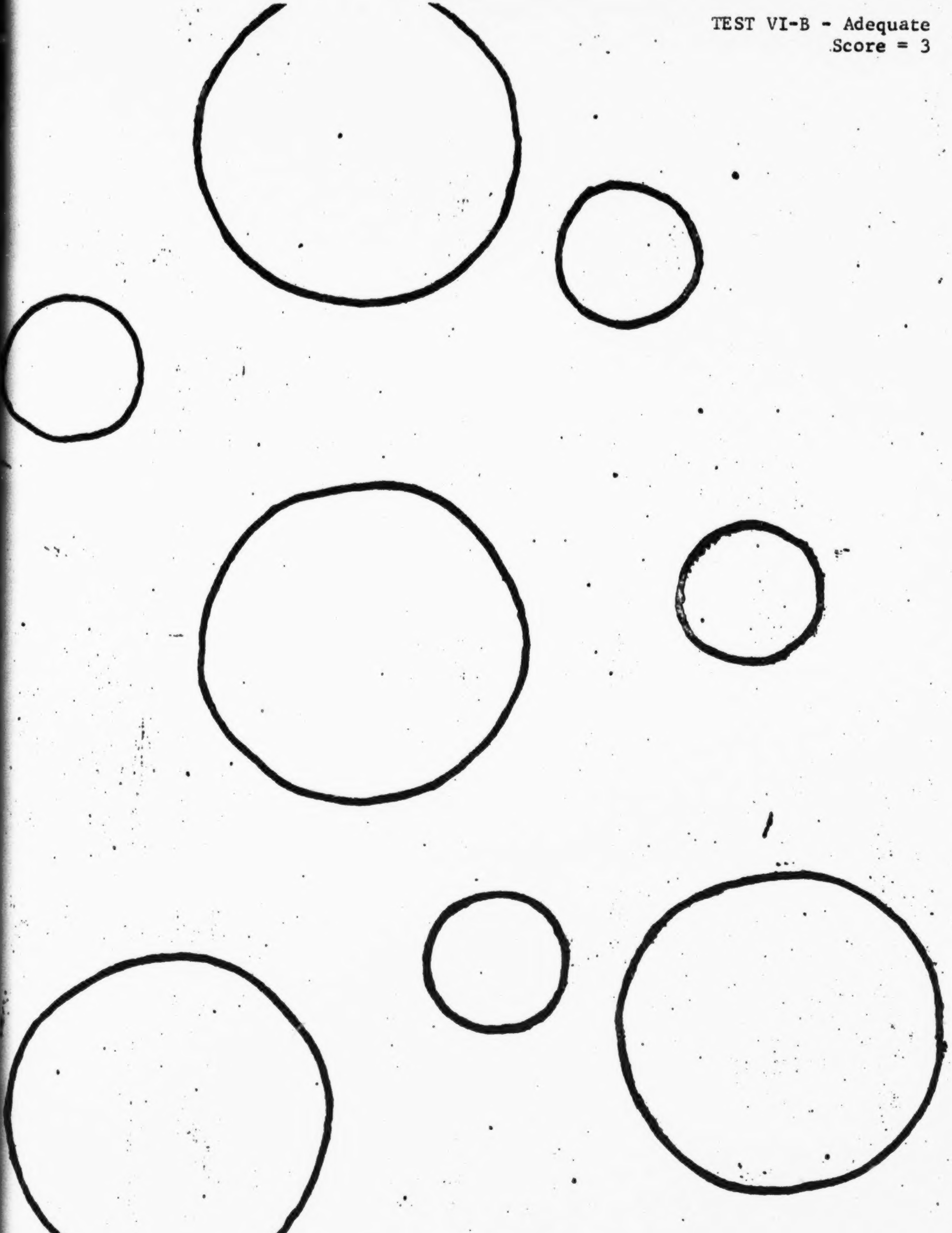


Figure 9. Samples of Adequate Performance on Eye-Hand Coordination Test.

E 6000 (REV. 9-66)

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
OFFICE OF EDUCATION

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TITLE

AN INVESTIGATION OF AN EVALUATION METHOD AND RETRAINING PROCEDURES FOR EMOTIONALLY HANDICAPPED CHILDREN WITH COGNITIVE-MOTOR DEFICITS

INTERIM REPORT

PERSONAL AUTHOR(S)

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Lafayette Clinic, Detroit, Michigan

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RETRIEVAL TERMS

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Assessment method
Cognitive-perceptual-motor dysfunction
Learning disability
Screening program

IDENTIFIERS

Lafayette Clinic Cognitive-Motor Battery

ABSTRACT

Using a 41-test battery of cognitive-perceptual-motor tests supplemented by standardized tests of intelligence, visual perception, eye-hand coordination, linguistics and non-verbal integration, a group of 200 maladjusted school age children from 1st, 2nd, 3rd and 5th grades were compared with a group of problem free children similar in size, sex distribution and other relevant characteristics. The findings supported the hypothesis that a significant percentage of maladjusted school children have serious immaturities in cognitive-perceptual-motor functioning which are associated with their behavior maladjustment and learning disorder. Two clearly distinguishable groups were found within each maladjusted grade group: a low dysfunction group of 60% who functioned well and similar to the problem free children on cognitive-motor tasks; and a high dysfunction group of 40% who were extremely low in their performance. This high dysfunction group was considered highly vulnerable to problem behavior and learning disorder, needing maximum attention at school.

A major product of the research is a complete test procedure, refined for economical use as a screening instrument in schools, clinics and day care centers. The tests provide information useful in remedial and retraining programs.